FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

LEFT and RIGHT BT3.0 + EDR HEADSET

MODEL NUMBER: ToqHSR1

FCC ID: 2AAIMHS1
IC: 10756B-HS1

REPORT NUMBER: 13U15243-1

ISSUE DATE: DECEMBER 20, 2013

Prepared for
QUALCOMM CONNECTED EXPERIENCE
5775 MOREHOUSE DRIVE
SAN DIEGO, CA 92121

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	01/07/2014	Initial Issue	G. Quizon

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: QUALCOMM CONNECTED EXPERIENCE, INC.
5775 MOREHOUSE DRIVE
SAN DIEGO, CA 92121

EUT DESCRIPTION: LEFT AND RIGHT BT3.0 +EDR HEADSET

MODEL: ToqHSR1

SERIAL NUMBER: 6190 & 60C1

DATE TESTED: DECEMBER 18 to 19, 2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

GEORGE QUIZON
EMC SUPERVISOR
UL Verification Services Inc.

Tested By:

THANH PHAM
EMC LAB ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth 3.0 + EDR enabled ear piece headset with a wireless charging receiver that is manufactured by Qualcomm.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	10.10	10.23
2402 - 2480	Enhanced 8PSK	11.30	13.49

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of -2 dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Toq Headset software, 0.9.2 Rev 9892

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Power line conducted emission was not performed since the EUT is operated by DC volts battery.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z, it was determined that the X-orientation was worst-case orientation; therefore; all final radiated testing was performed with the EUT in X-orientation.

5.1. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
BLUETOOTH TESTER	R&S	CBT	100900	

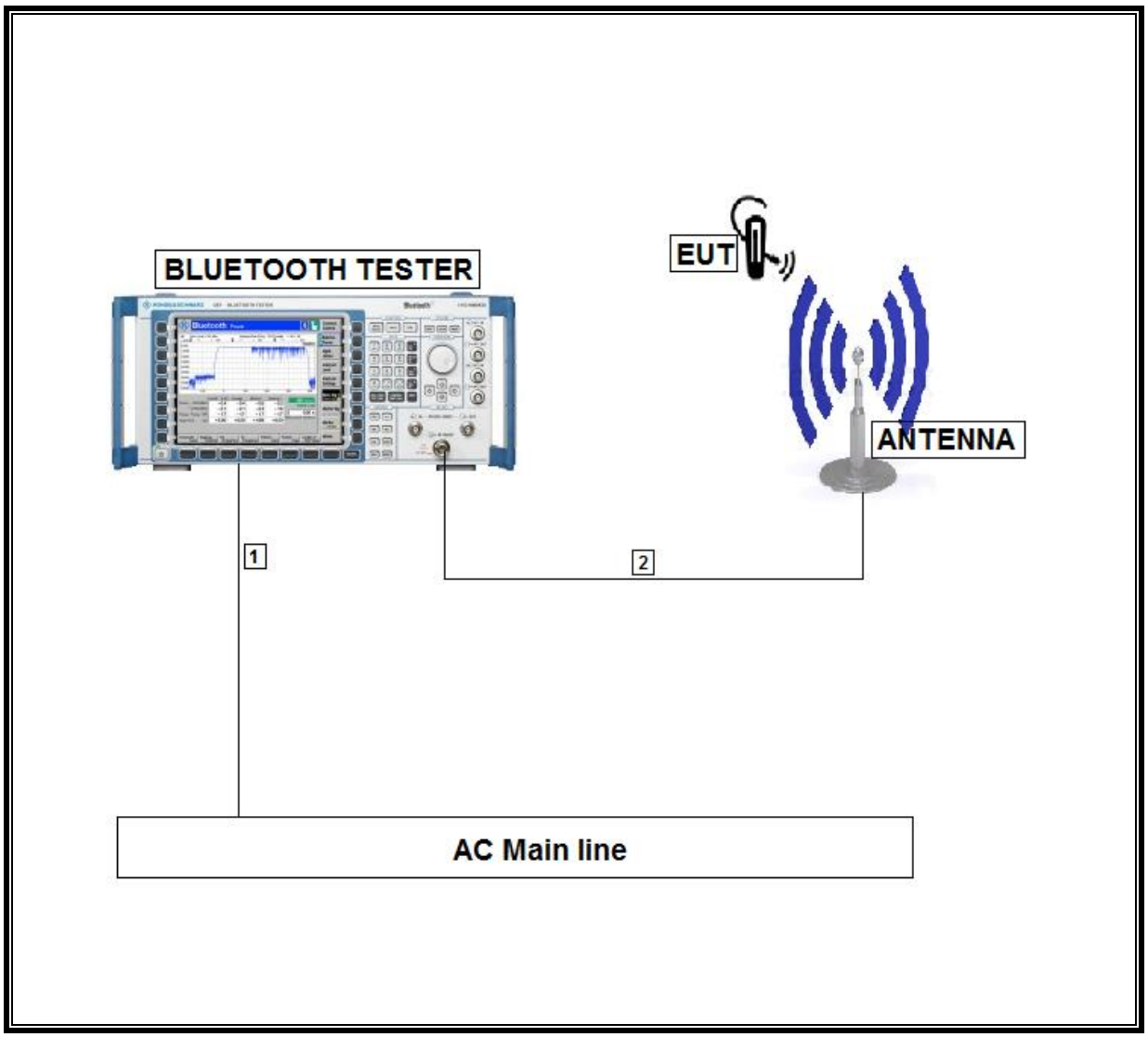
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shield	1m	
2	SMA	1	SMA	Shield	0.5 - 5m	

TEST SETUP

EUT was set to test mode to enable wireless communications and was continuously communicating with the Bluetooth tester during the tests.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	02/16/13	02/16/14
Spectrum Analyzer, 40 GHz	Agilent	E4446A	C01159	10/04/13	10/04/14
EMI Test Receiver, 9kHz-7GHz	R&S	ESCI 7	1000741	07/13/13	07/13/14
PXA Signal Analyzer	Agilent	N9030A	14615711	01/22/13	01/22/14
Horn Antenna, 1GHz-18GHz	ETS Lindgren	3117	T345	02/19/13	02/19/14
Antenna, Horn, 18 GHz	EMCO	3115	C01218	01/18/13	01/18/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/13	11/14/14
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	06/28/13	06/28/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/13	02/13/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	10/19/13	10/19/14
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/20/13	08/20/14
Peak Power Meter	Agilent / HP	N1911A	T386	04/02/13	04/02/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/16/13	01/16/14
Low Pass Filter	Micro-Tronics	LPS17541	F00219	06/26/13	06/26/14
High Pass Filter	Micro-Tronics	HPS17542	F00222	06/26/13	06/26/14
High Pass Filter	Micro-Tronics	HPM17543	F00224	06/26/13	06/26/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	08/15/13	08/15/14

7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

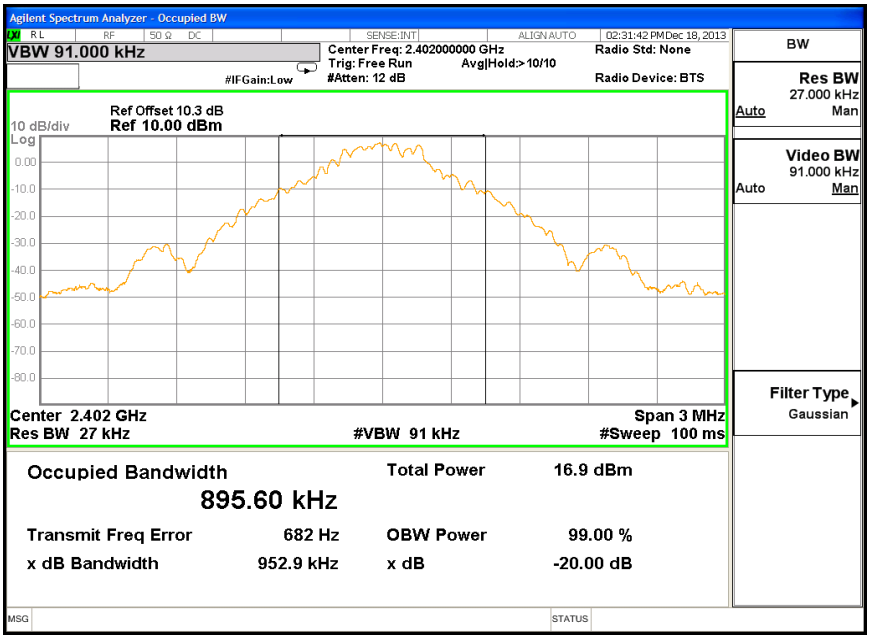
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

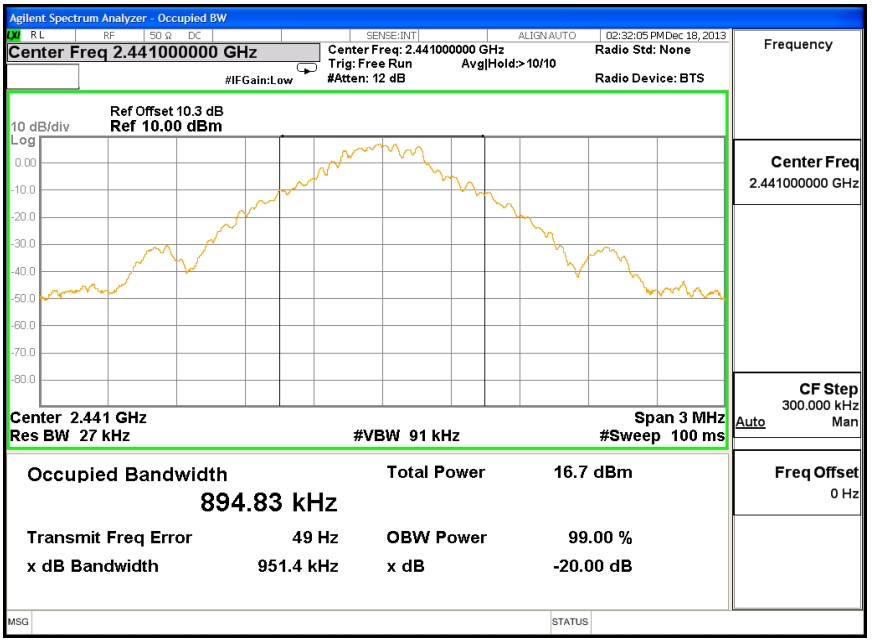
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	952.9	917.77
Middle	2441	951.4	895.81
High	2480	952.5	902.53

20 dB BANDWIDTH

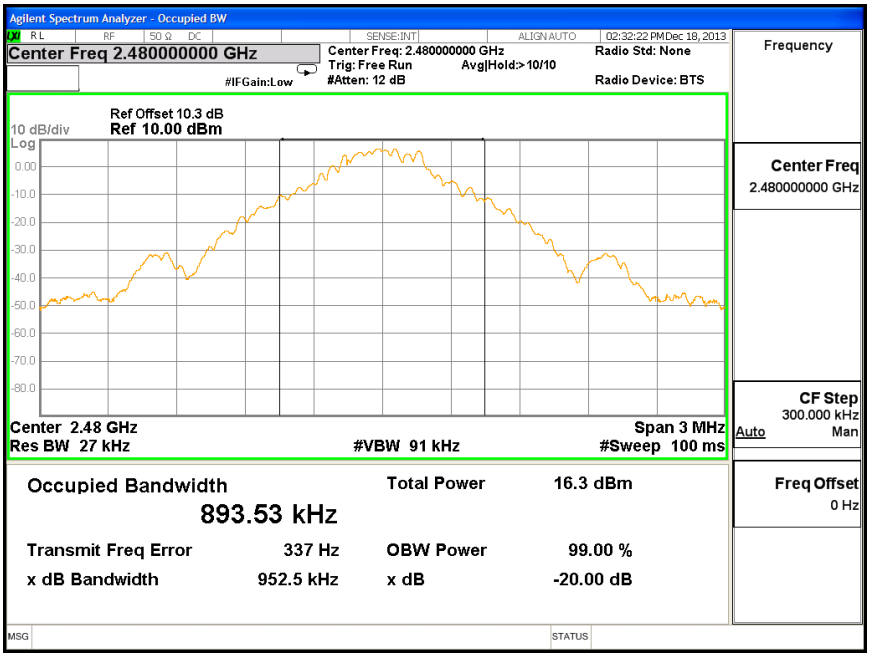
BANDWIDTH LOW CH



BANDWIDTH MID CH

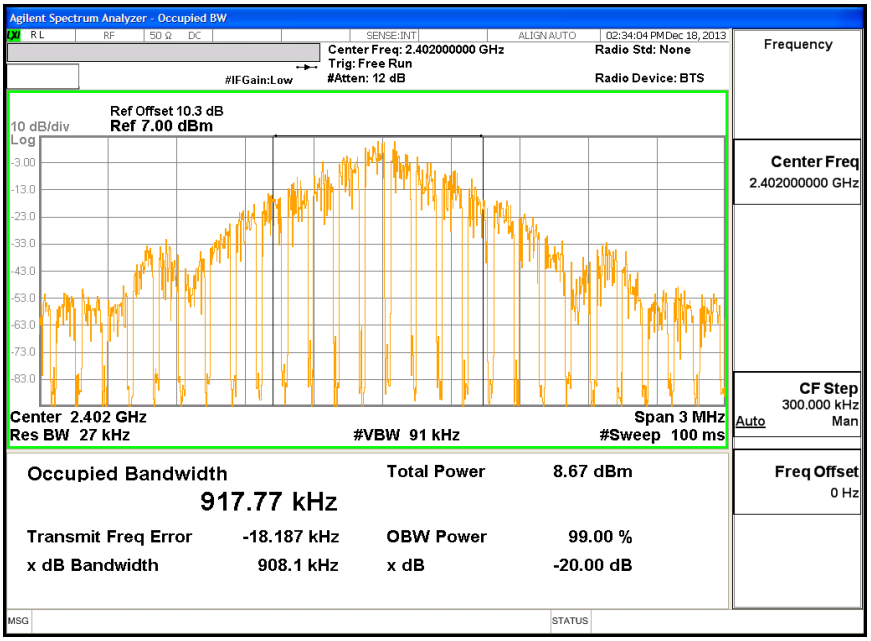


BANDWIDTH HIGH CH

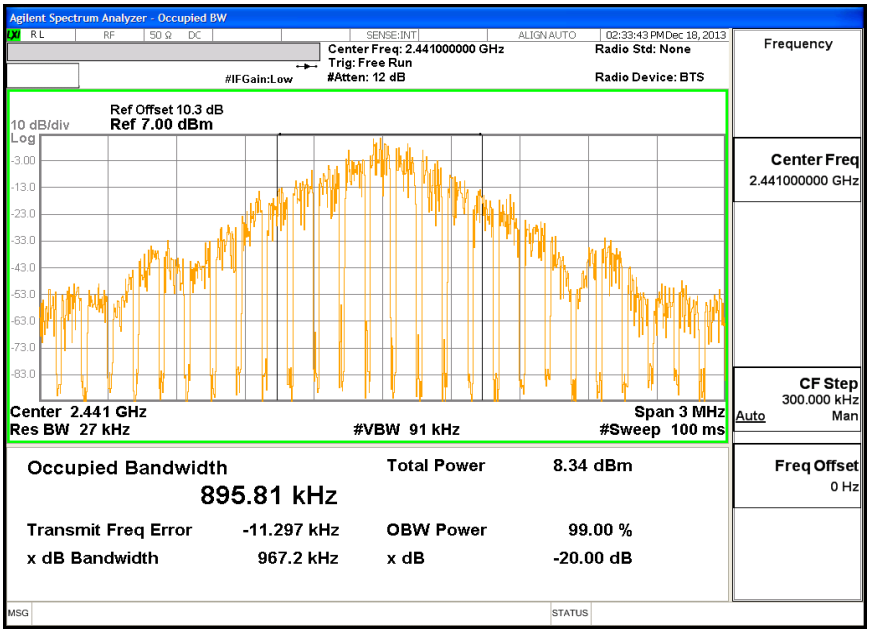


99% BANDWIDTH

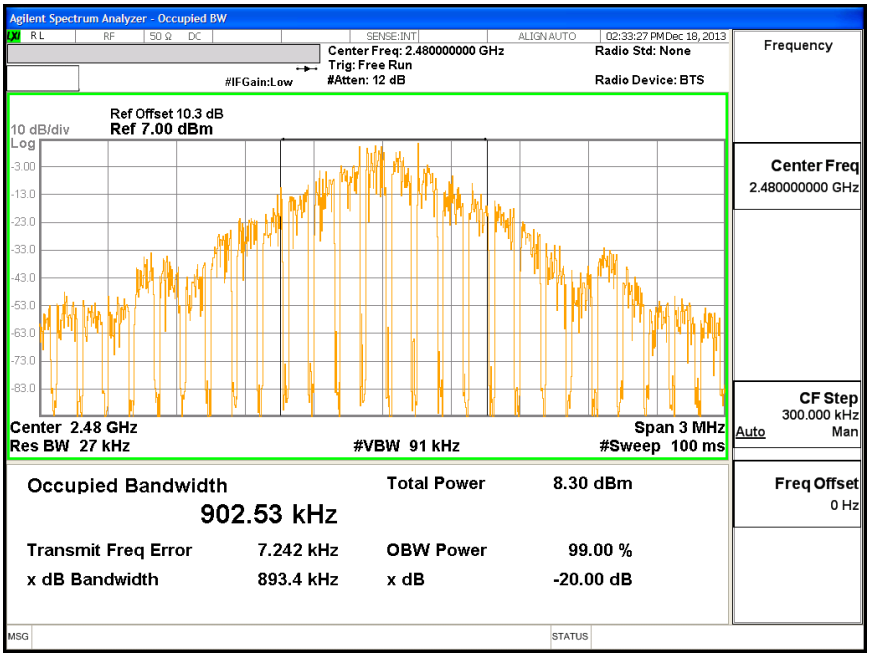
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

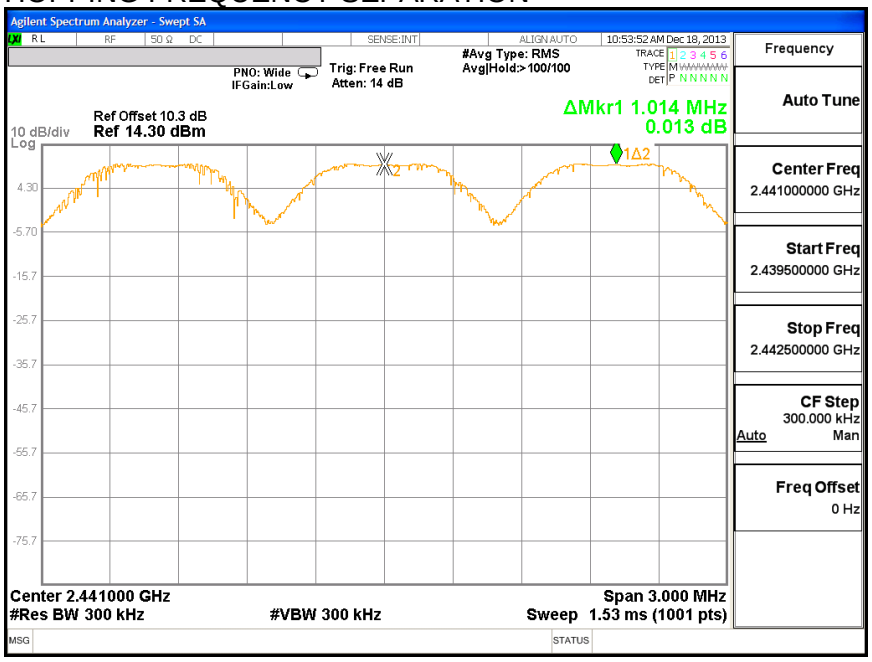
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION



7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

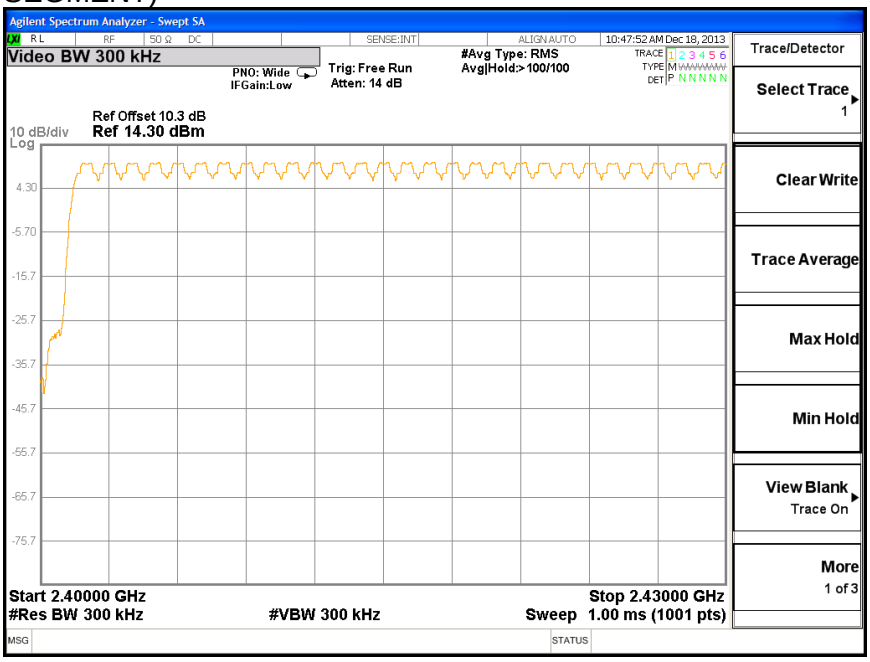
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

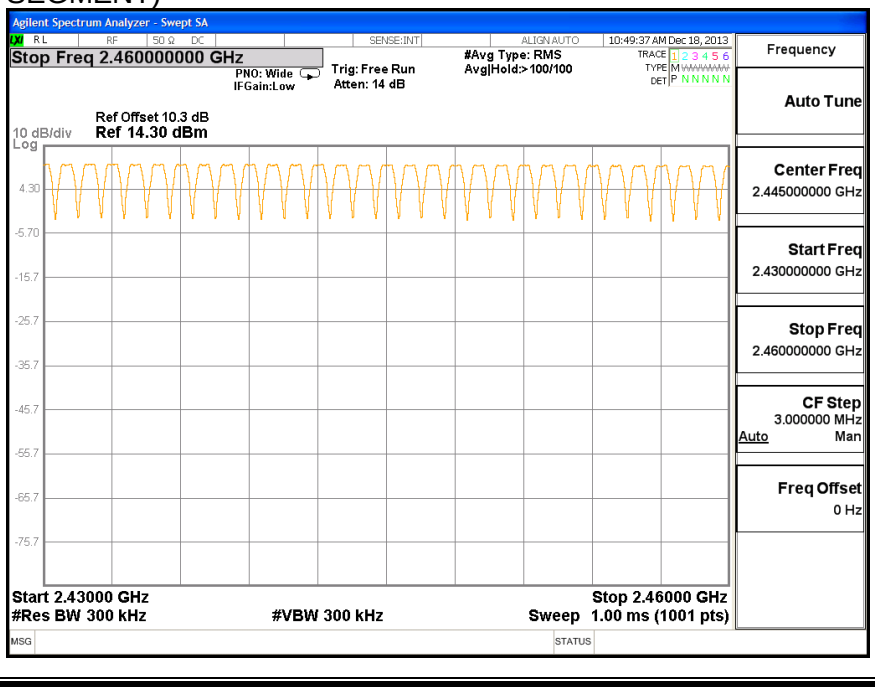
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

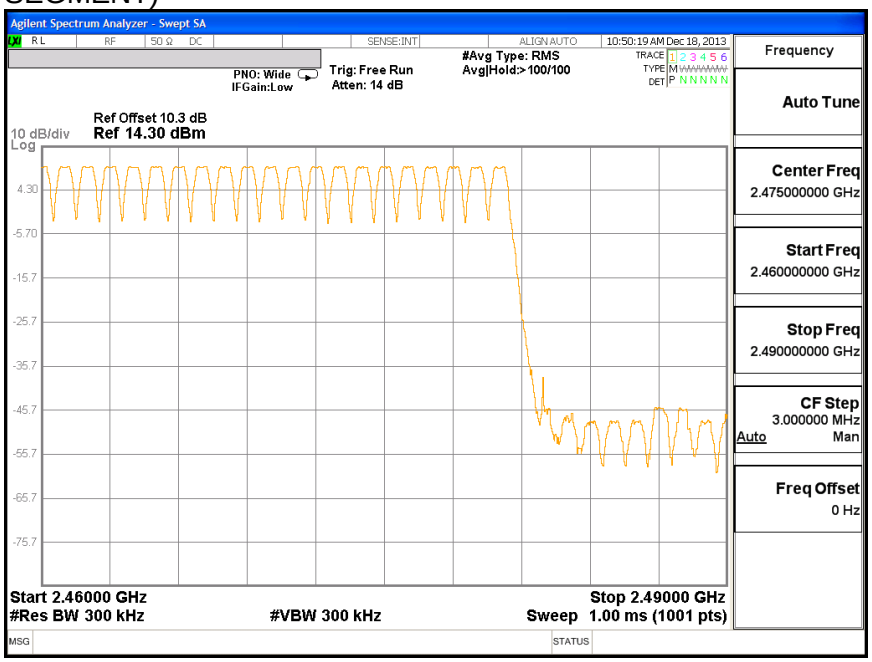
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.1.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

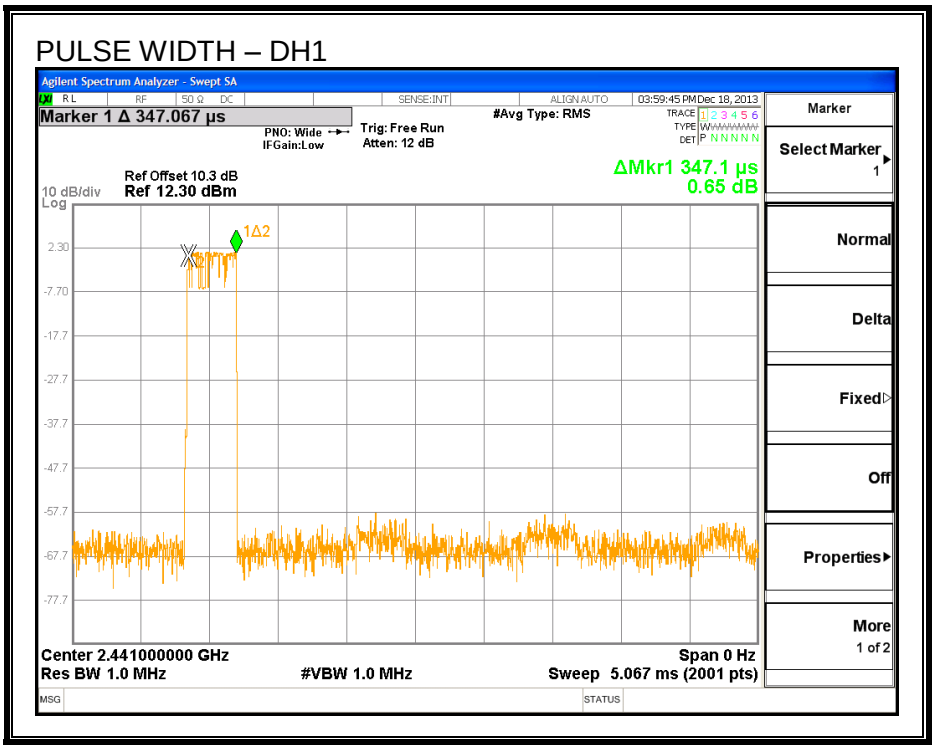
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

RESULTS

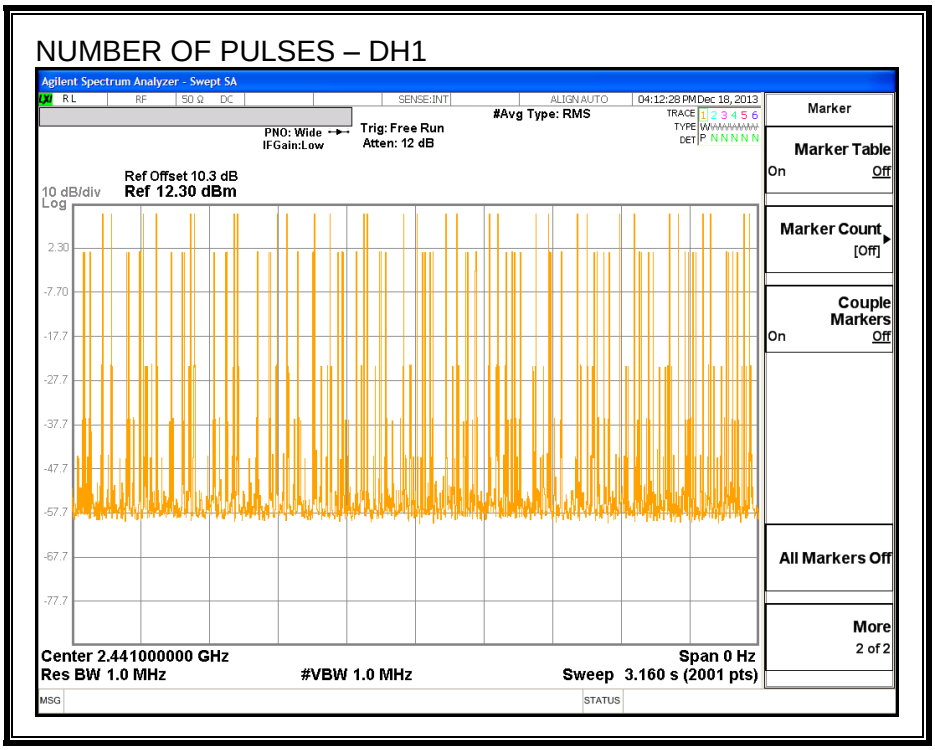
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.3471	31	0.108	0.4	-0.292
DH3	1.630	16	0.261	0.4	-0.139
DH5	2.878	11	0.317	0.4	-0.083
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.3471	7.84	0.027	0.4	-0.373
DH3	1.63	4.05	0.066	0.4	-0.334
DH5	2.878	2.7	0.078	0.4	-0.322

Note: This device supports adaptive frequency hopping (AFH) which uses the same psudo random channel selection algorithm as is used for non AFH mode. Since the dwell time requirements are based on the number of channels, by showing compliance with the channel dwell time requirements for 79 channels, compliance is also demonstrated for N channels, where $20 \leq N \leq 79$.

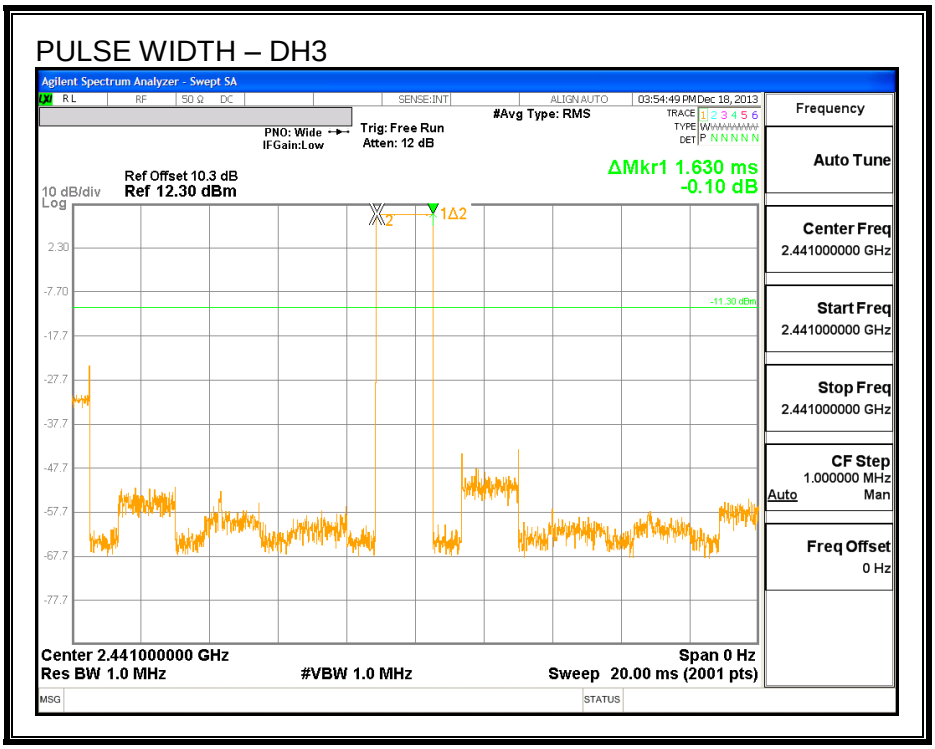
PULSE WIDTH - DH1



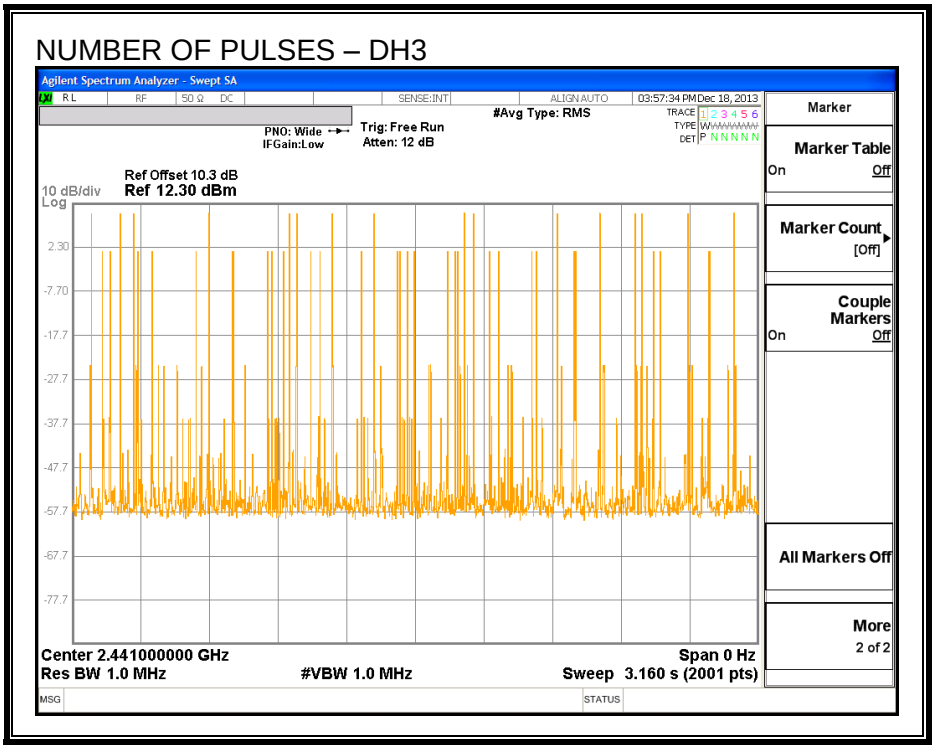
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



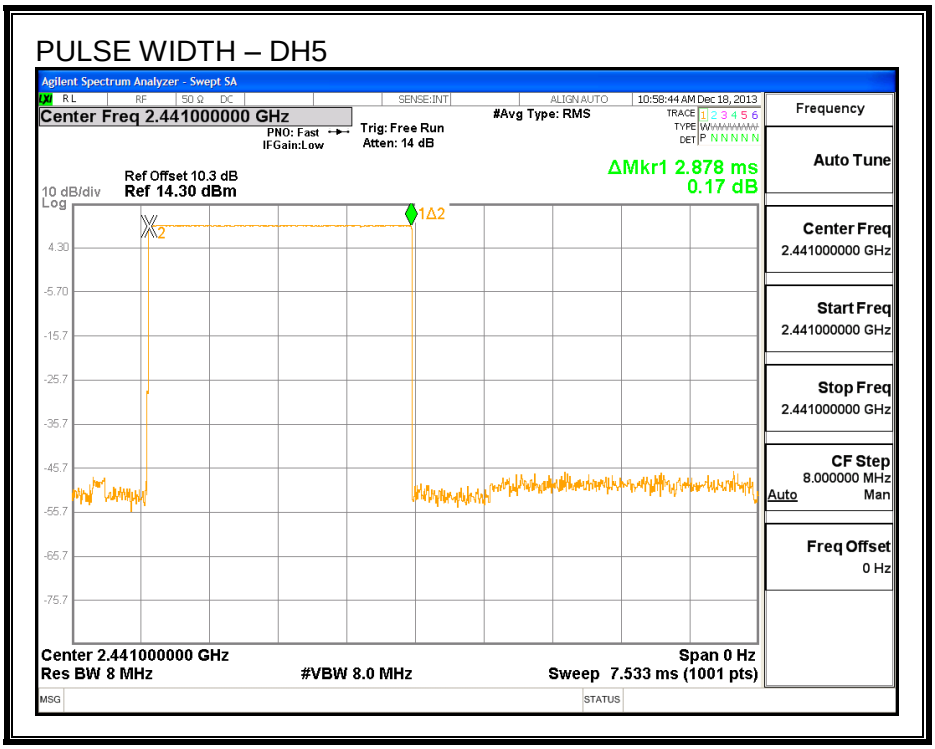
PULSE WIDTH – DH3



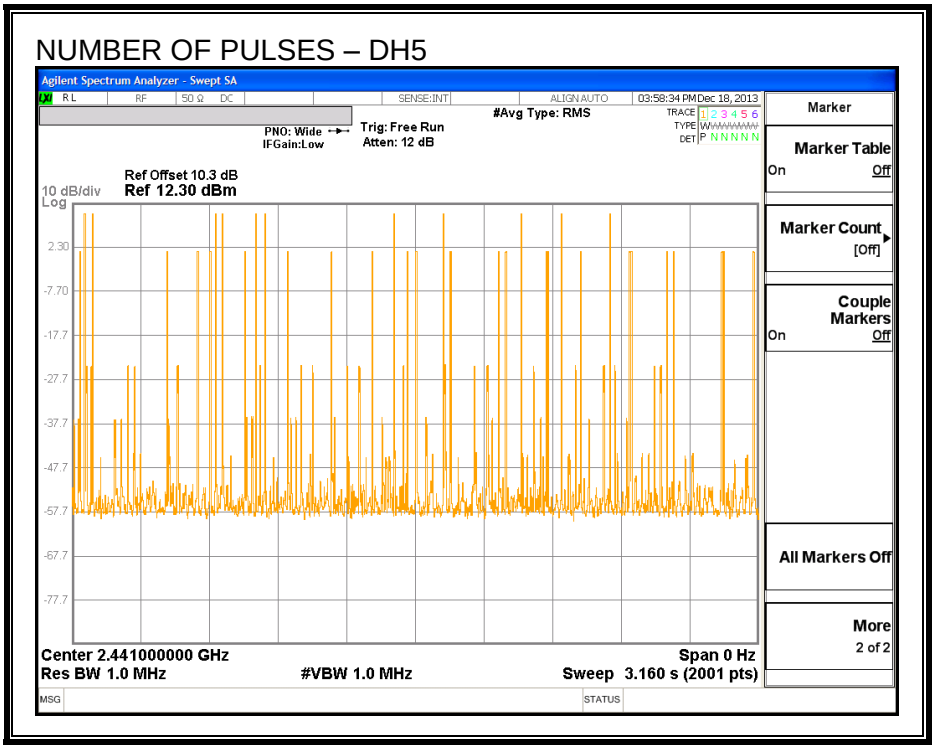
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.1.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

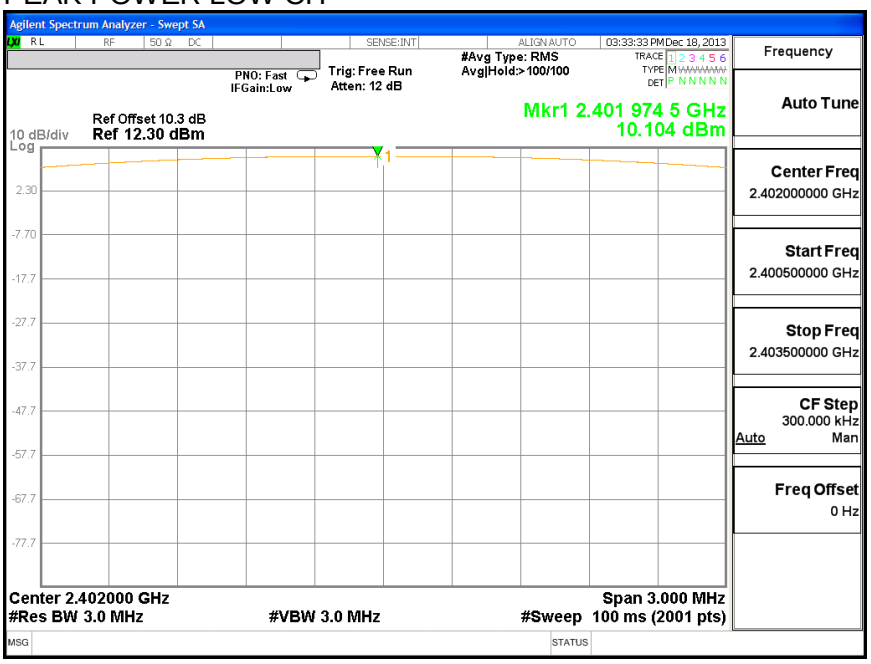
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

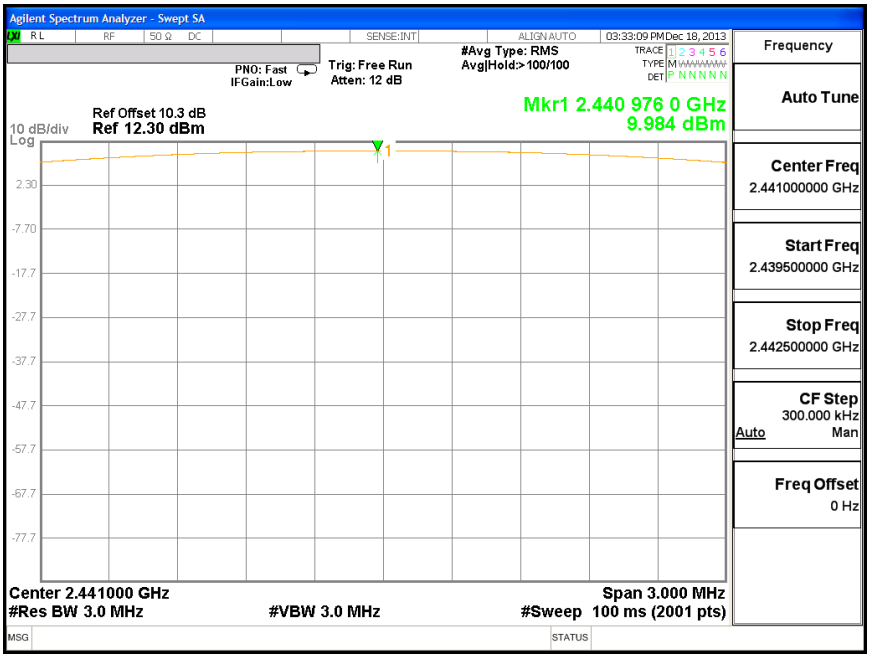
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.10	30	-19.90
Middle	2441	9.98	30	-20.02
High	2480	9.62	30	-20.38

OUTPUT POWER

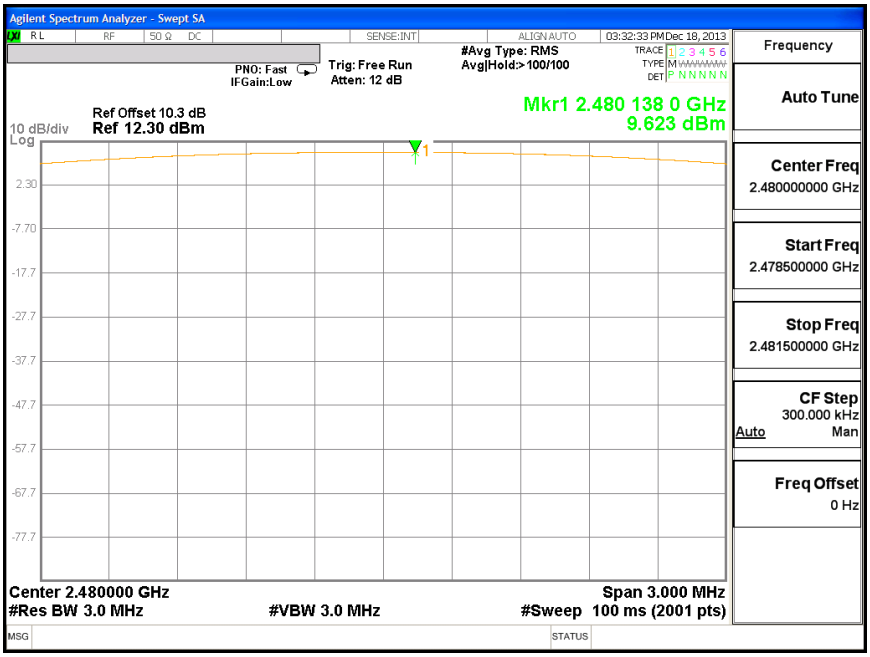
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.1.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 1.3 dB (including 0.5 dB directional coupler and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.40
Middle	2441	9.30
High	2480	9.00

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

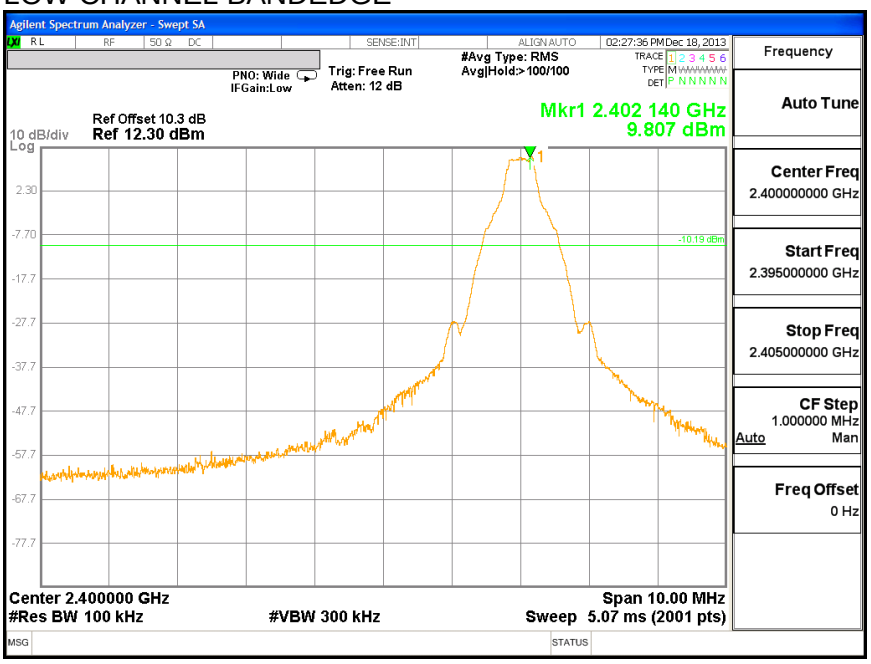
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

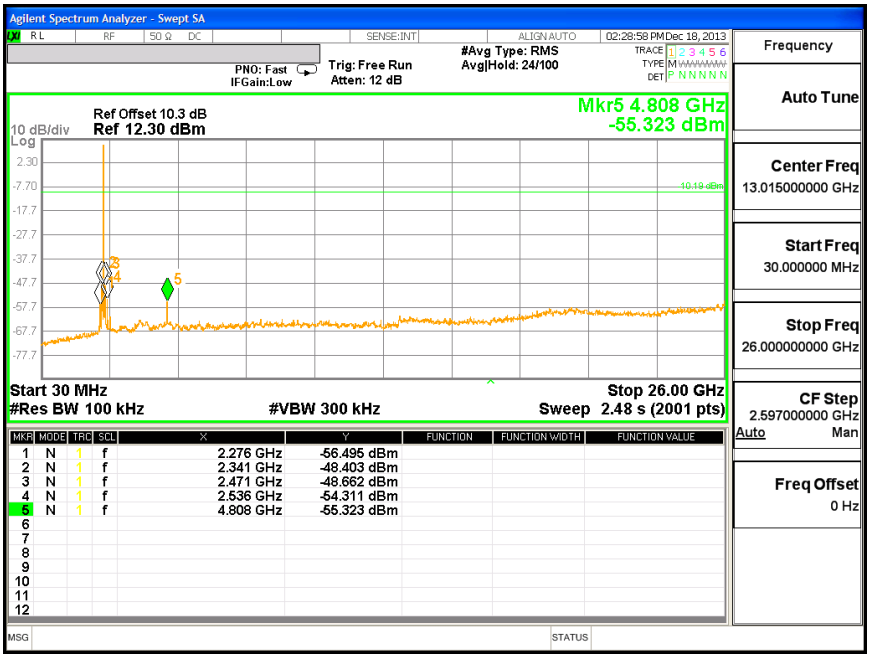
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

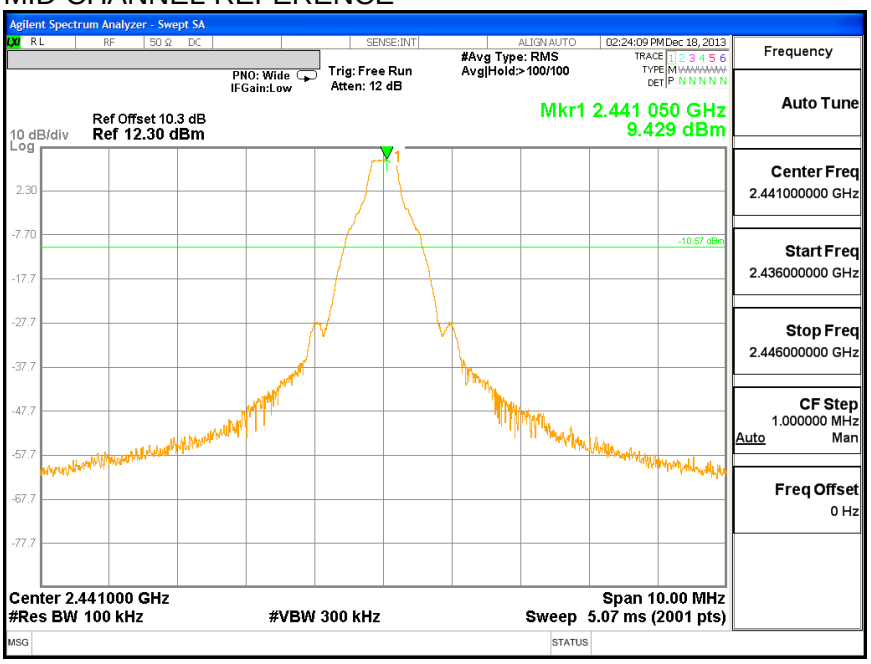


LOW CHANNEL SPURIOUS

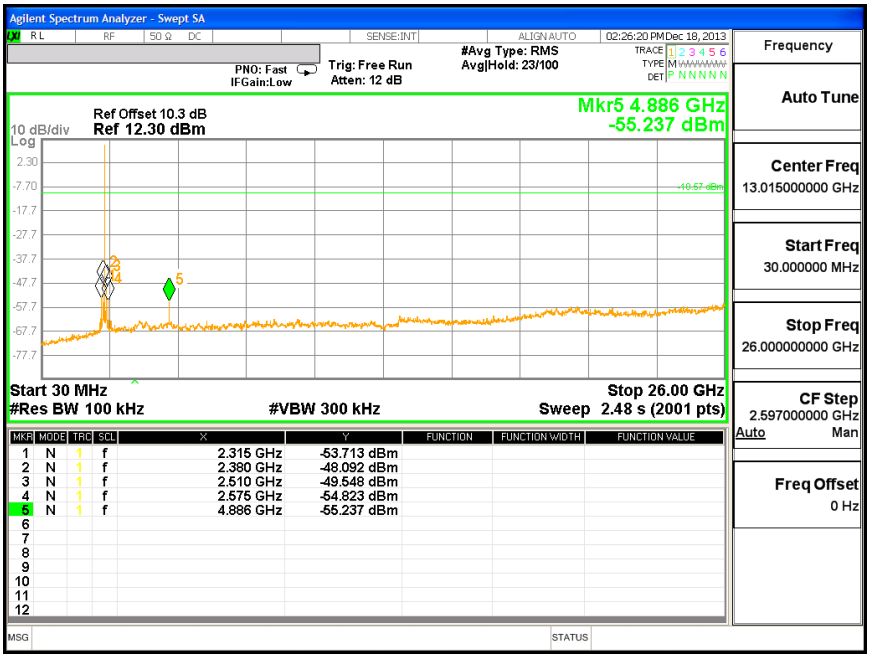


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

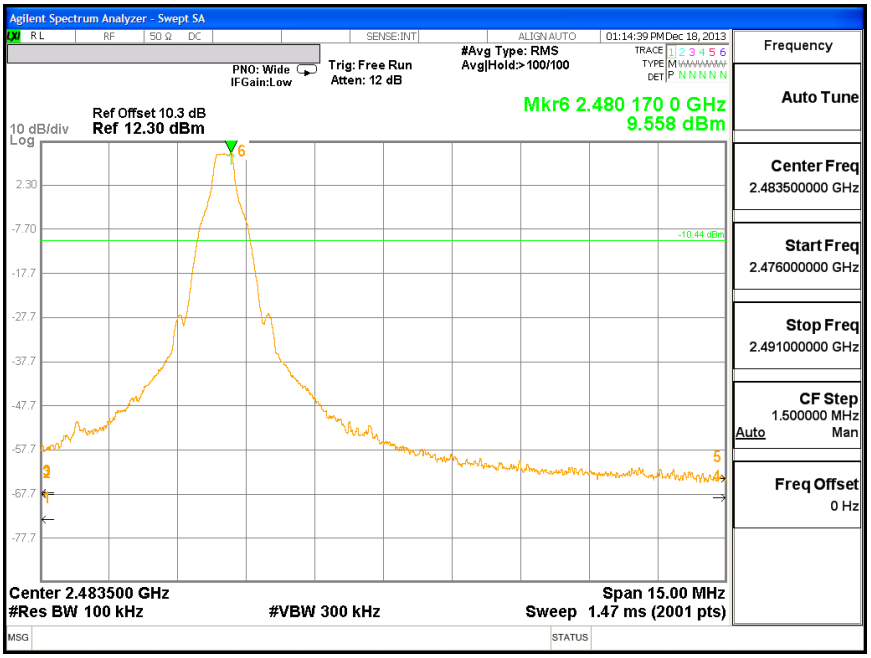


MID CHANNEL SPURIOUS

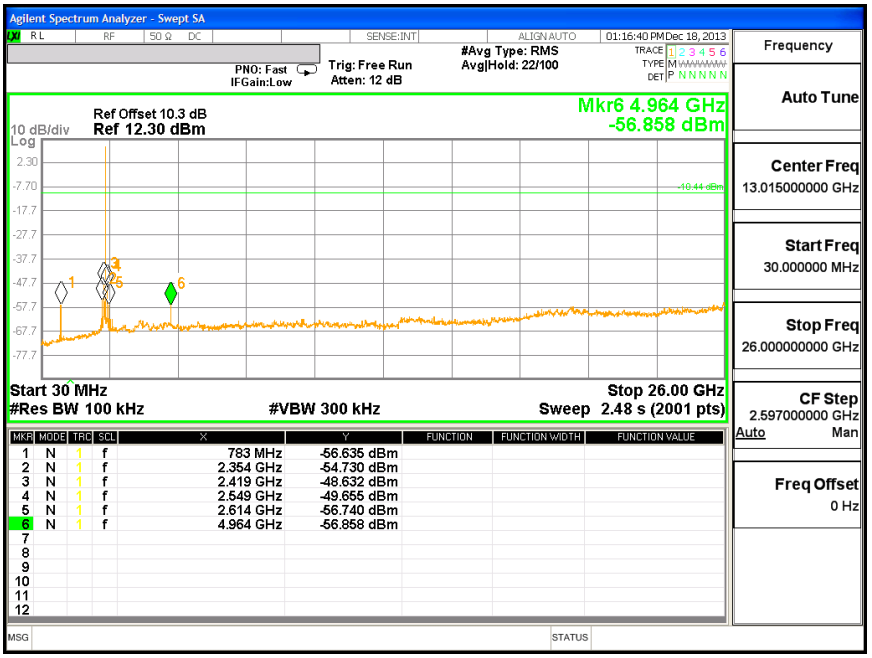


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

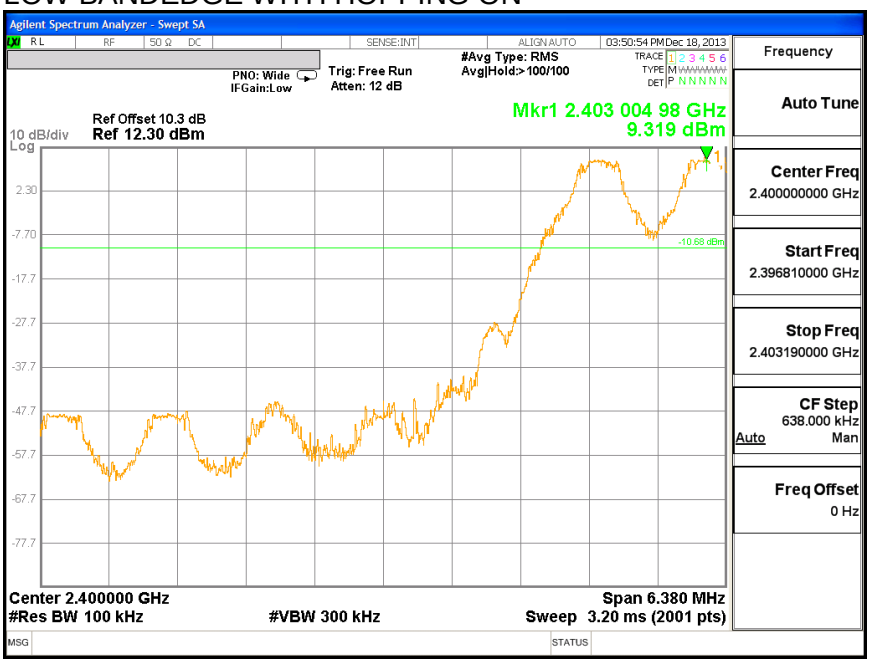


HIGH CHANNEL SPURIOUS

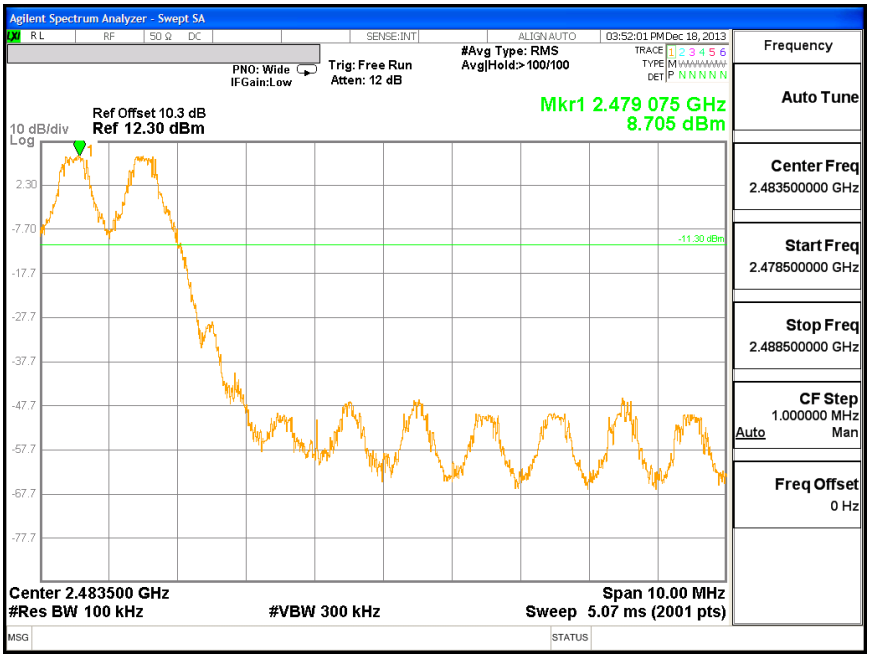


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

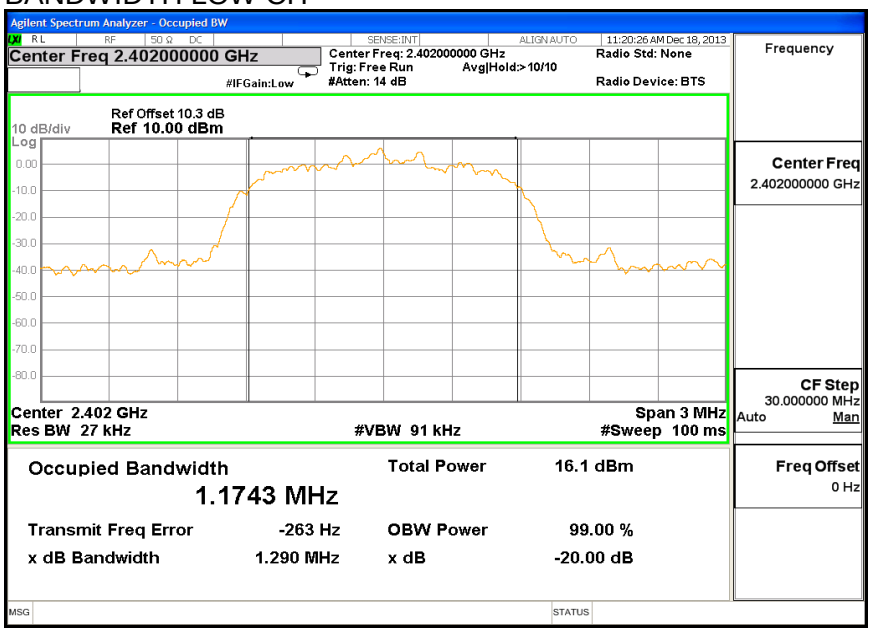
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

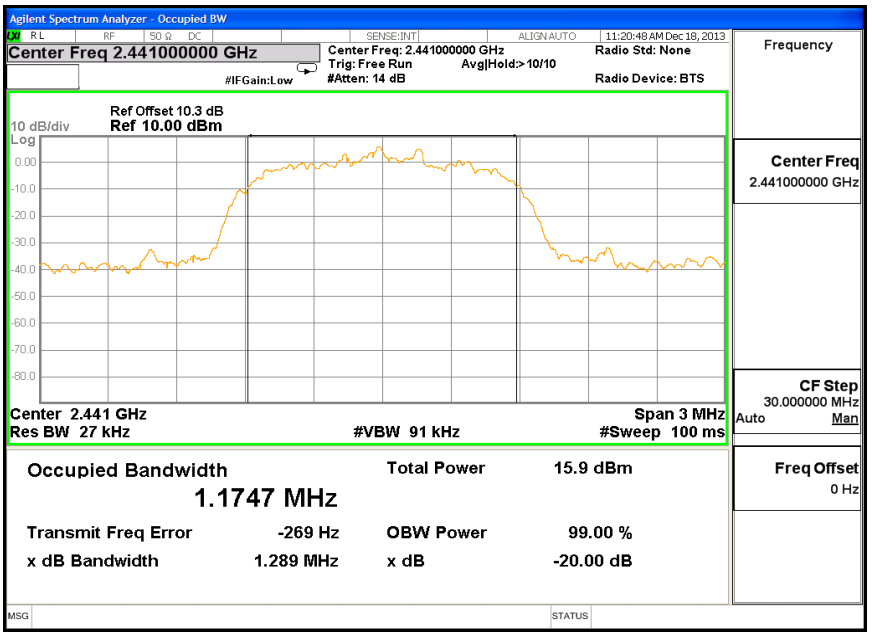
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1290	1.1818
Middle	2441	1289	1.2133
High	2480	1289	1.2067

20 dB BANDWIDTH

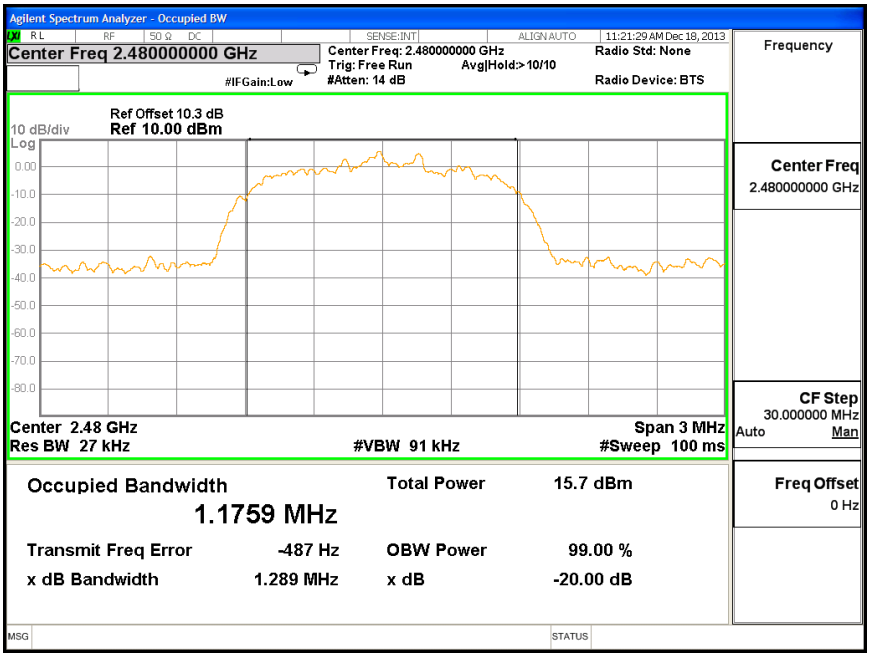
BANDWIDTH LOW CH



BANDWIDTH MID CH

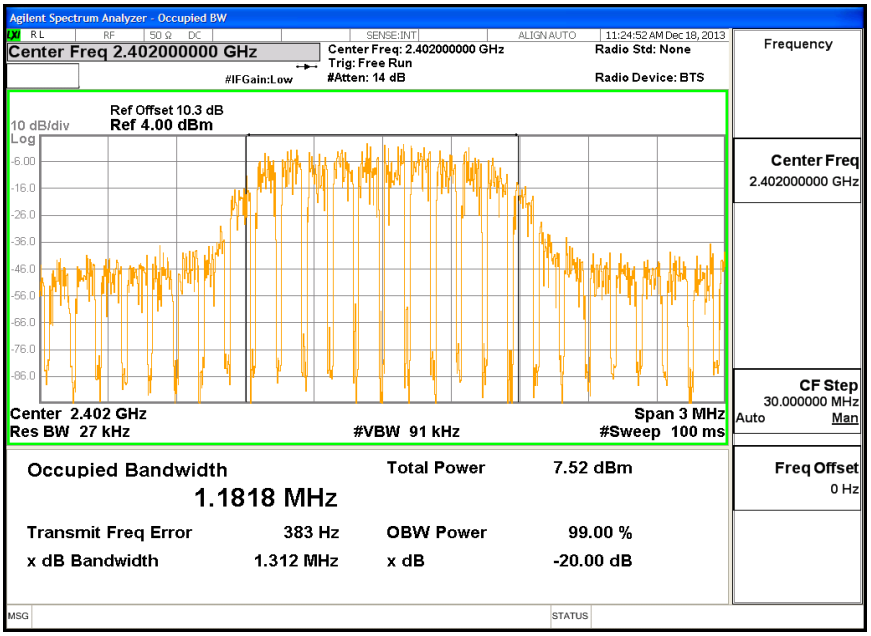


BANDWIDTH HIGH CH

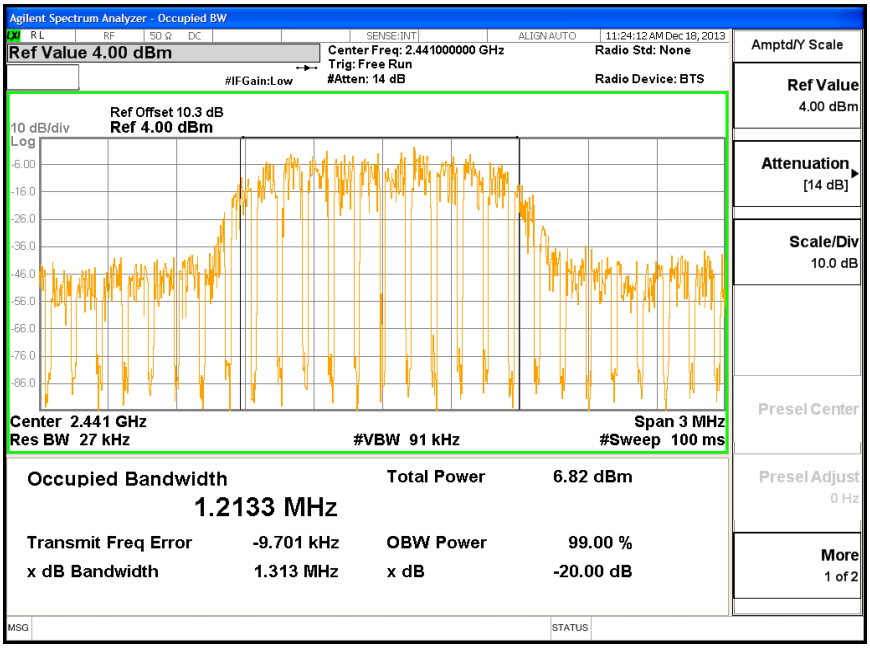


99% BANDWIDTH

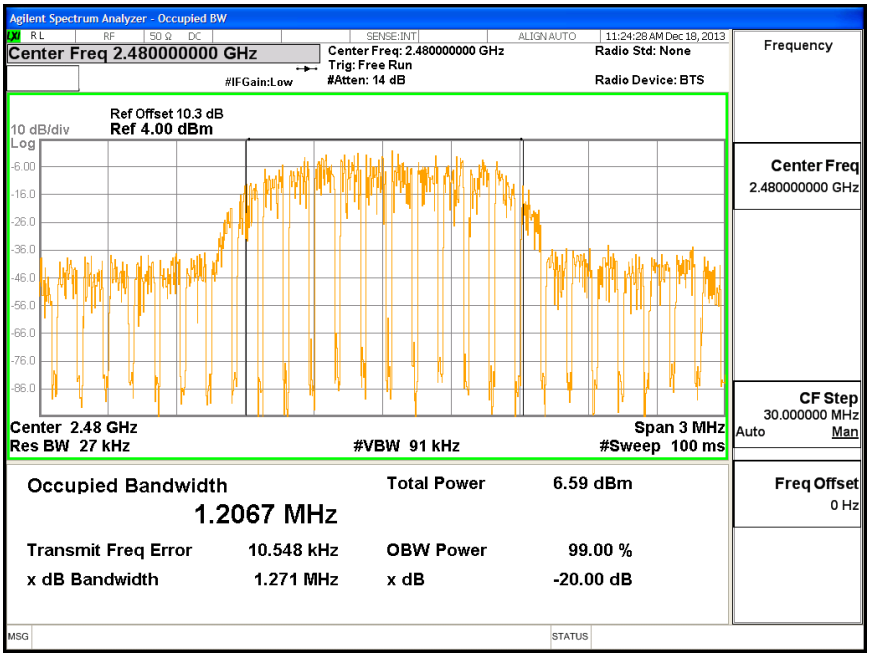
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

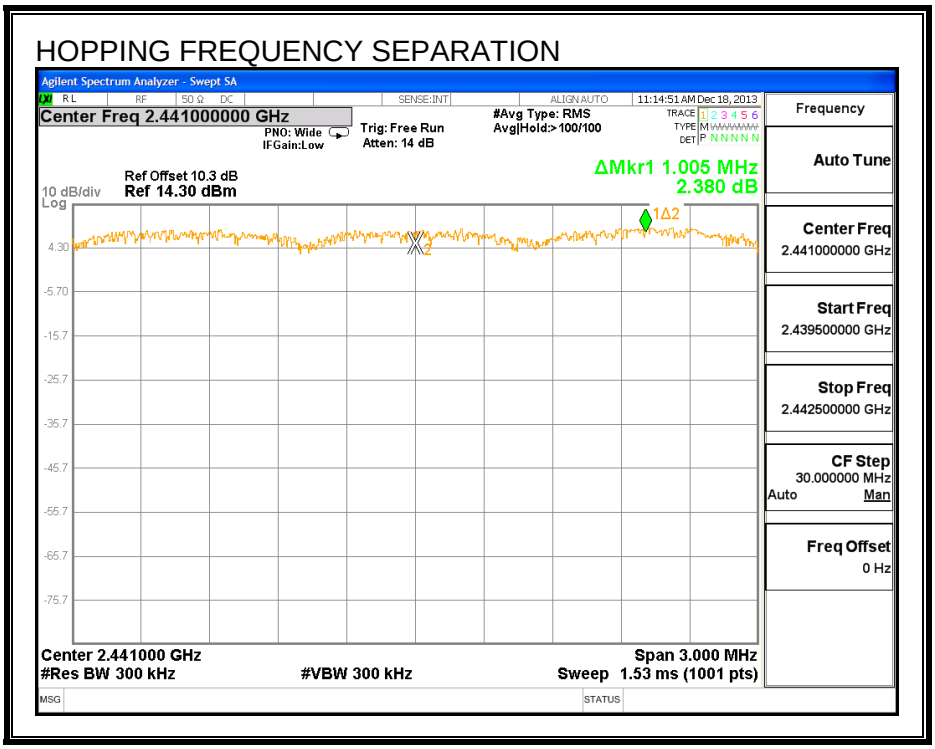
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION



7.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

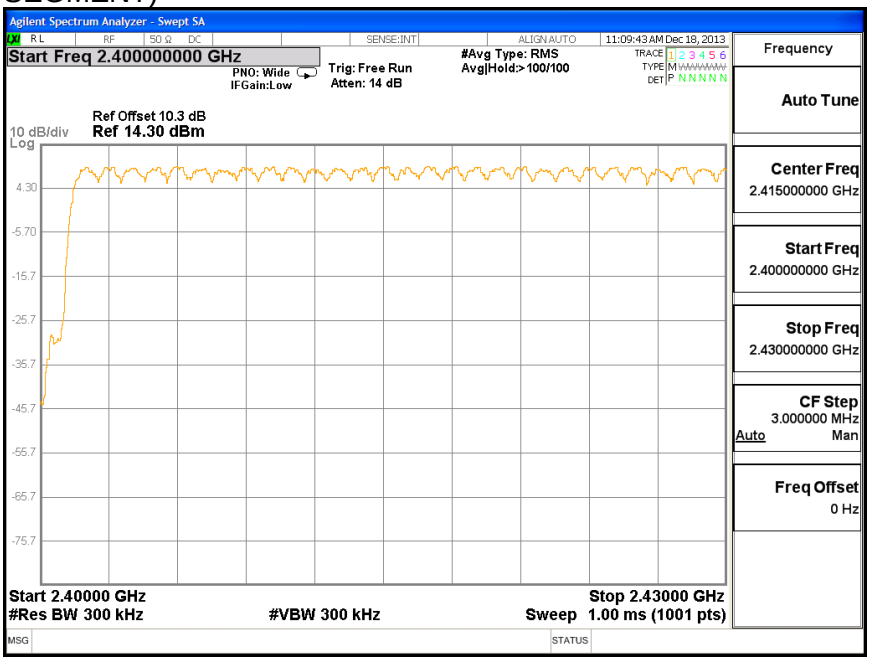
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

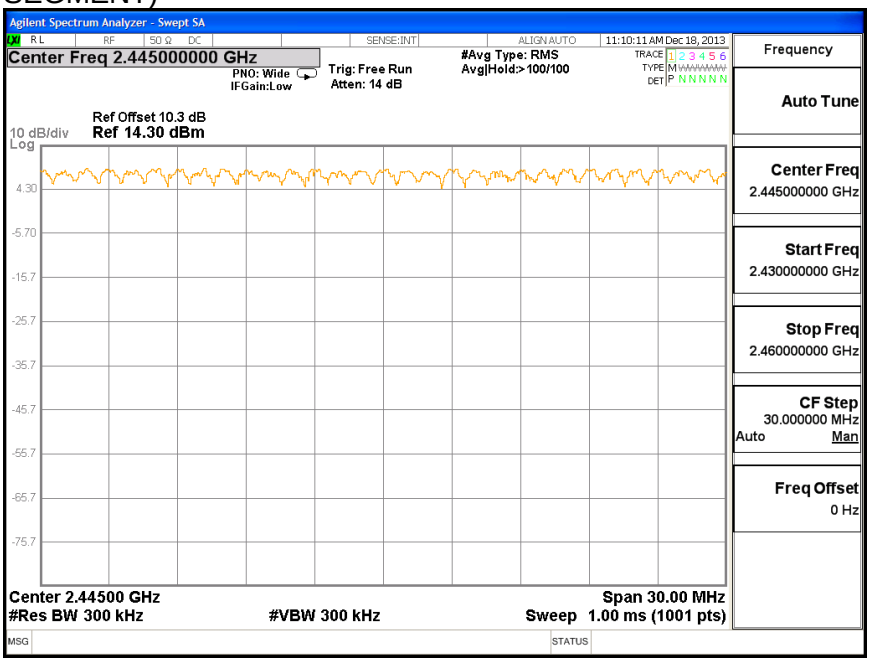
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

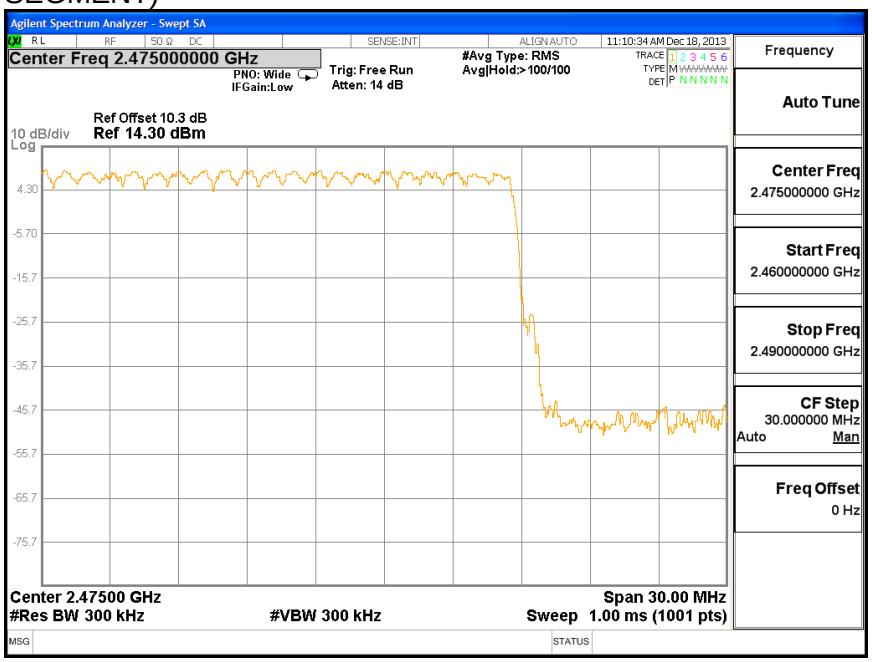
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

8PSK (EDR) Mode

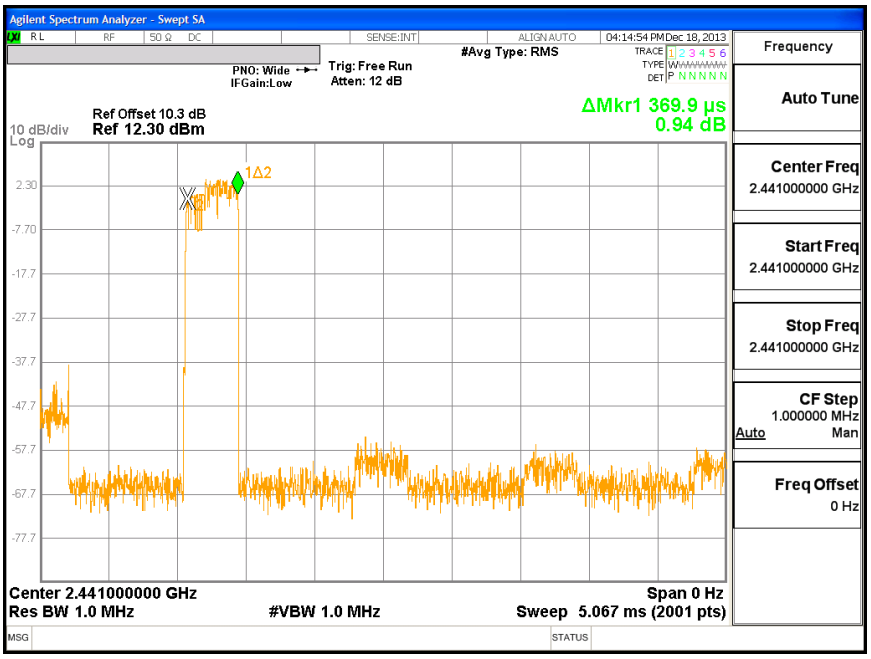
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.3699	31	0.115	0.4	-0.285
DH3	1.636	16	0.262	0.4	-0.138
DH5	2.87	11	0.316	0.4	-0.084

Note: for AFH (8PSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate on page 21 demonstrates compliance with channel occupancy when AFH is employed

.

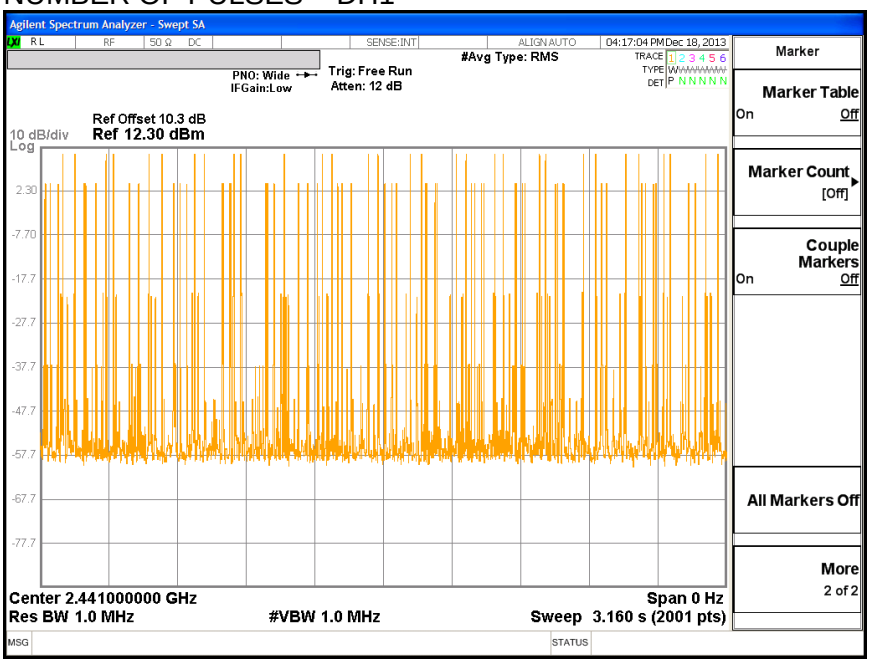
PULSE WIDTH - DH1

PULSE WIDTH – DH1

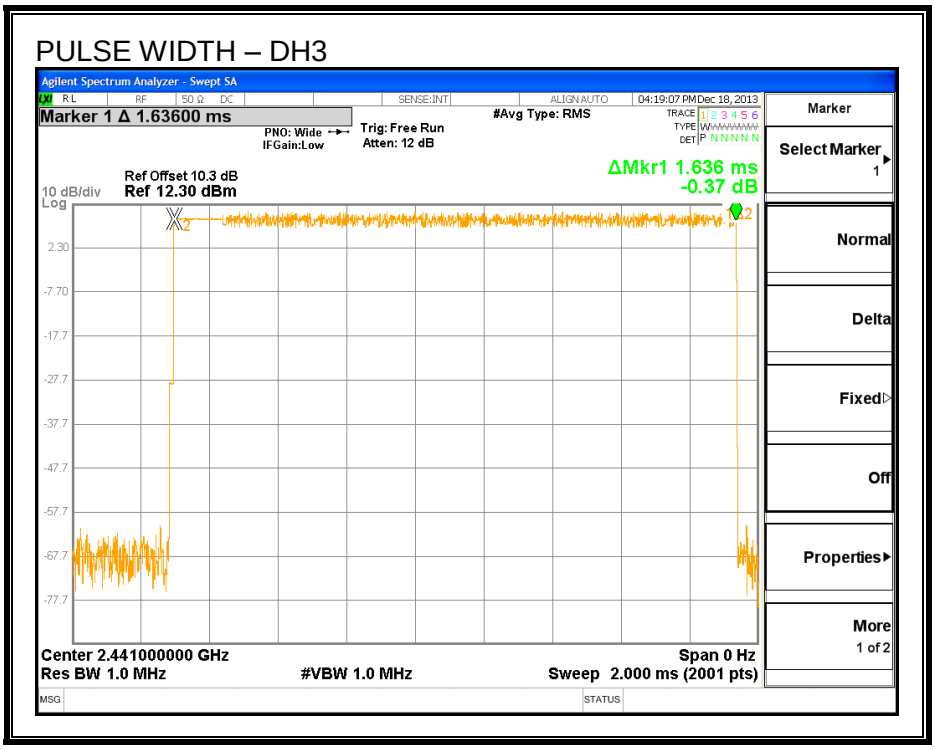


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1

NUMBER OF PULSES – DH1

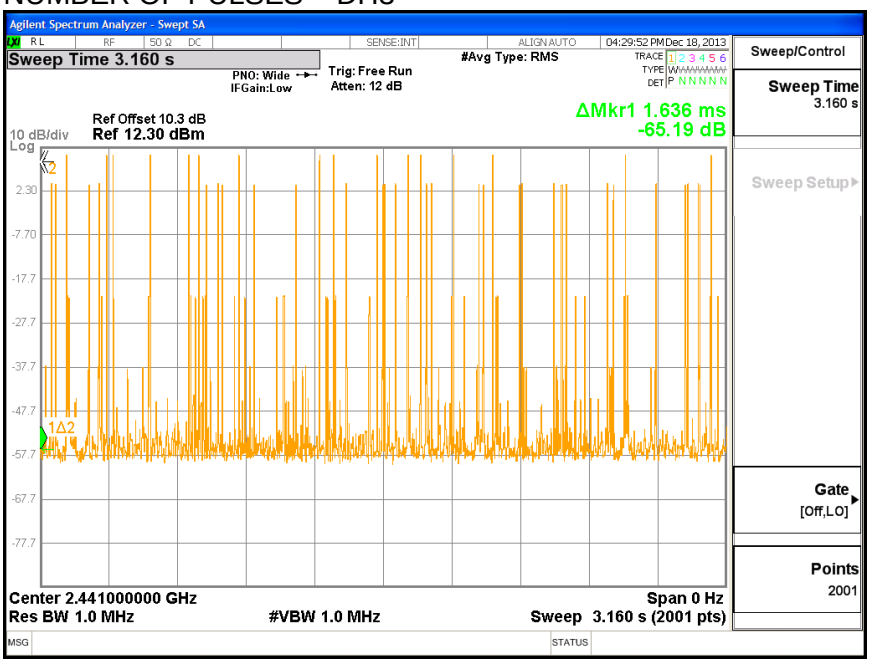


PULSE WIDTH – DH3

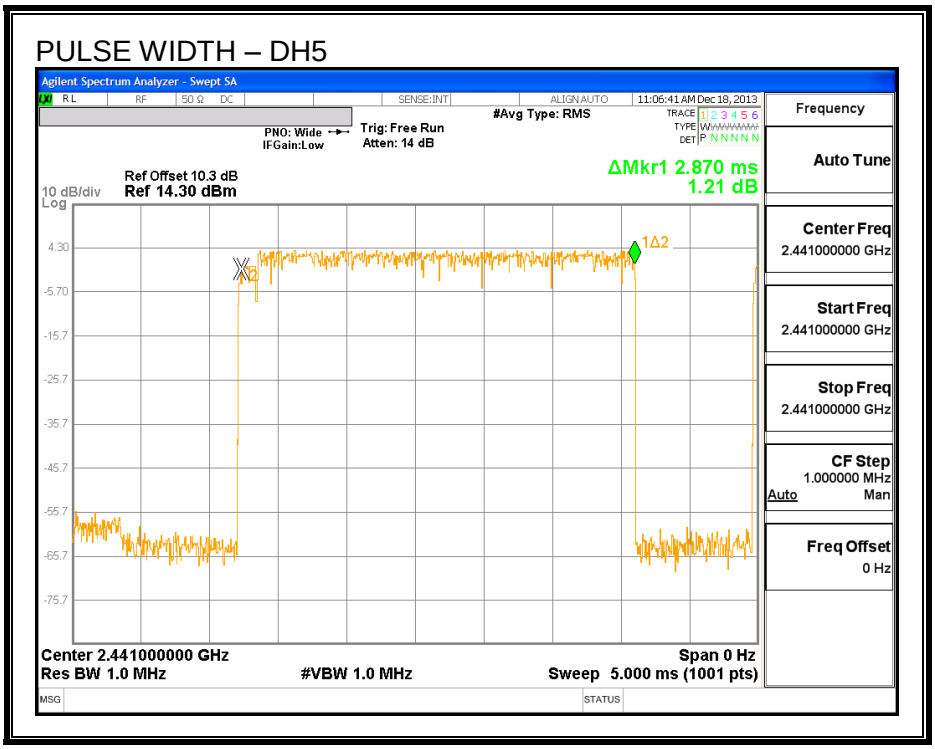


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3

NUMBER OF PULSES – DH3

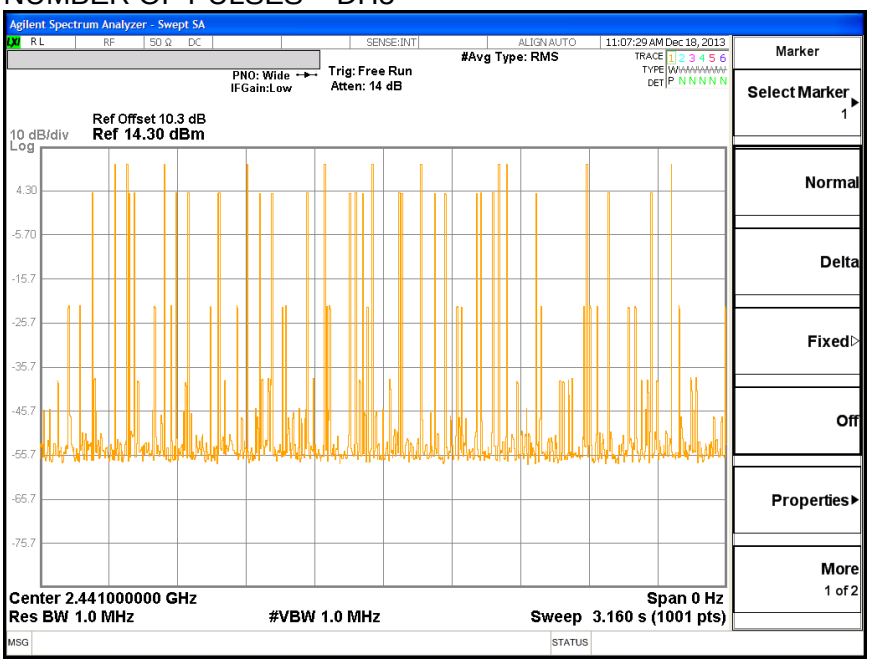


PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

NUMBER OF PULSES – DH5



7.2.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

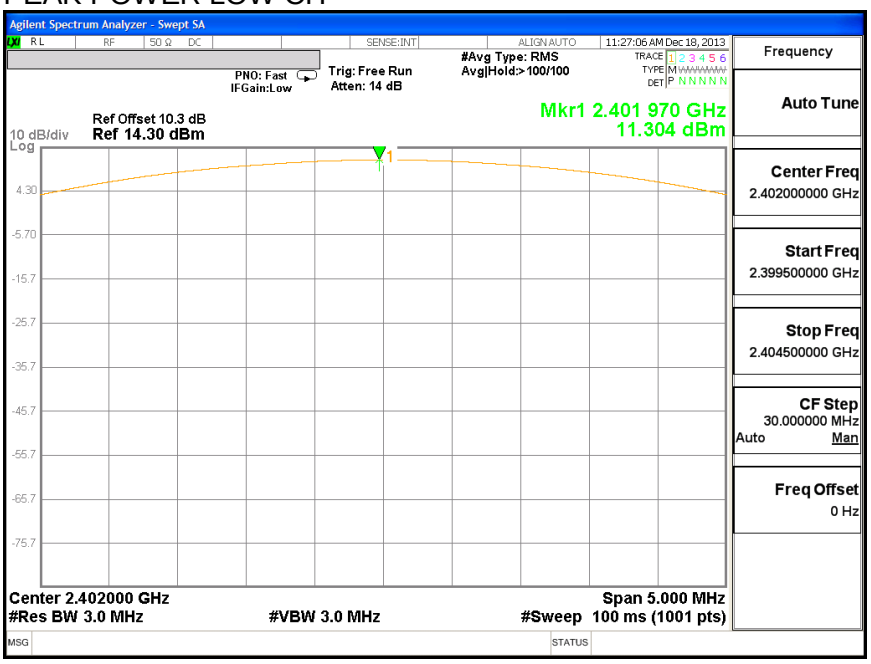
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

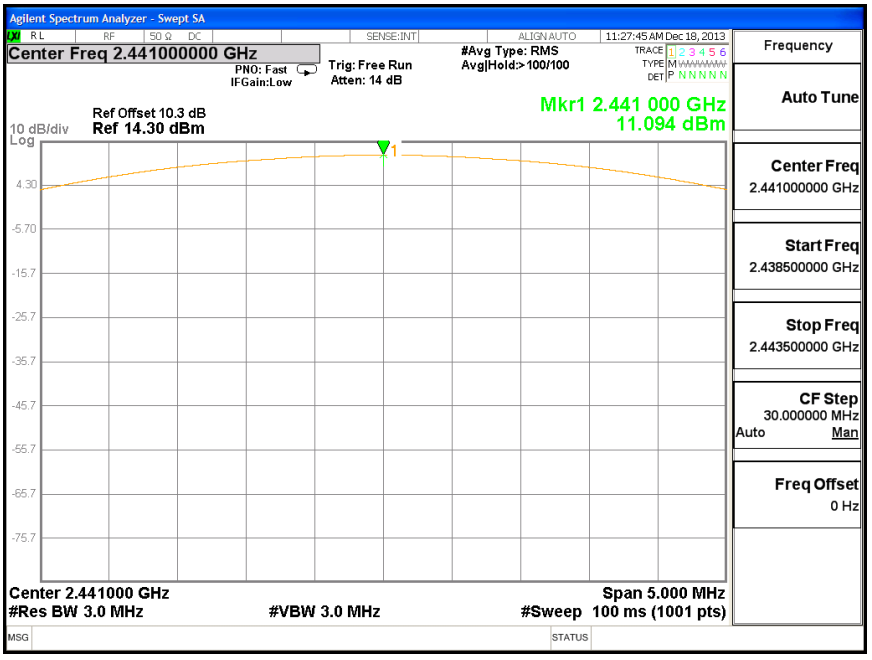
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.30	30	-18.70
Middle	2441	11.09	30	-18.91
High	2480	10.59	30	-19.41

OUTPUT POWER

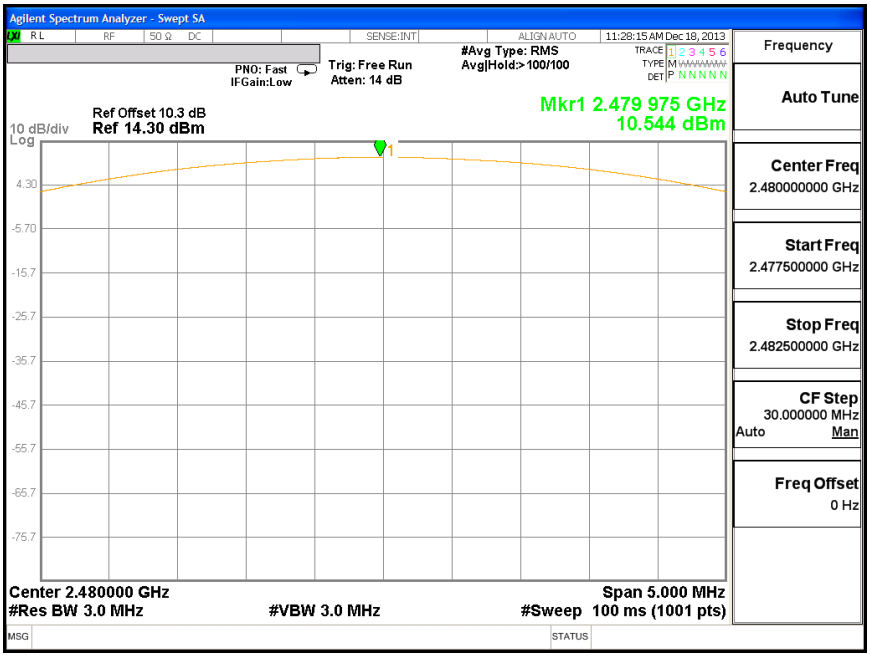
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.2.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 1.3 dB (including 0.5 dB directional coupler and 0.80 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Frequency (MHz)	Average Power (dBm)
2402	7.80
2441	7.80
2480	7.50

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

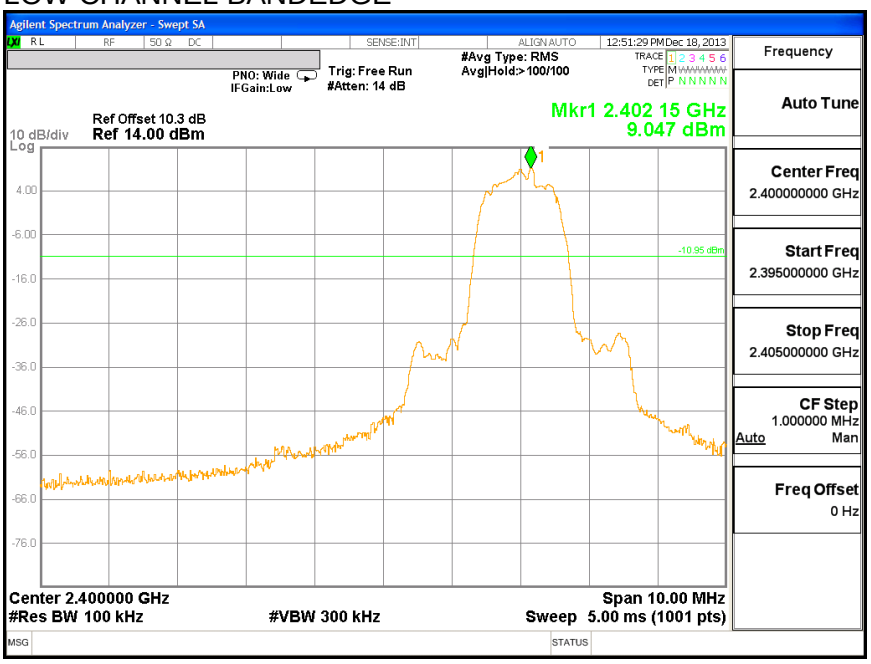
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

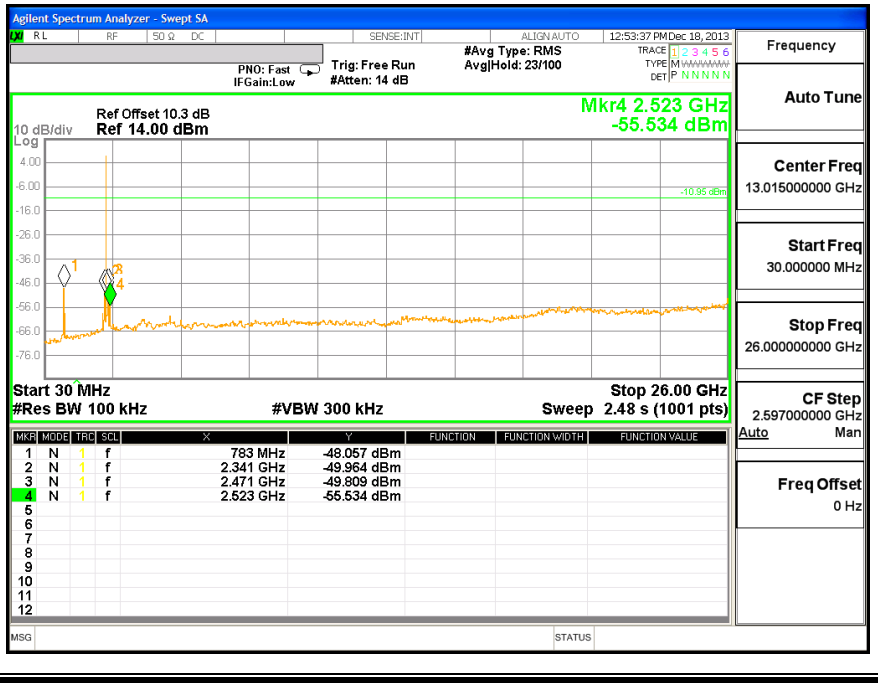
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

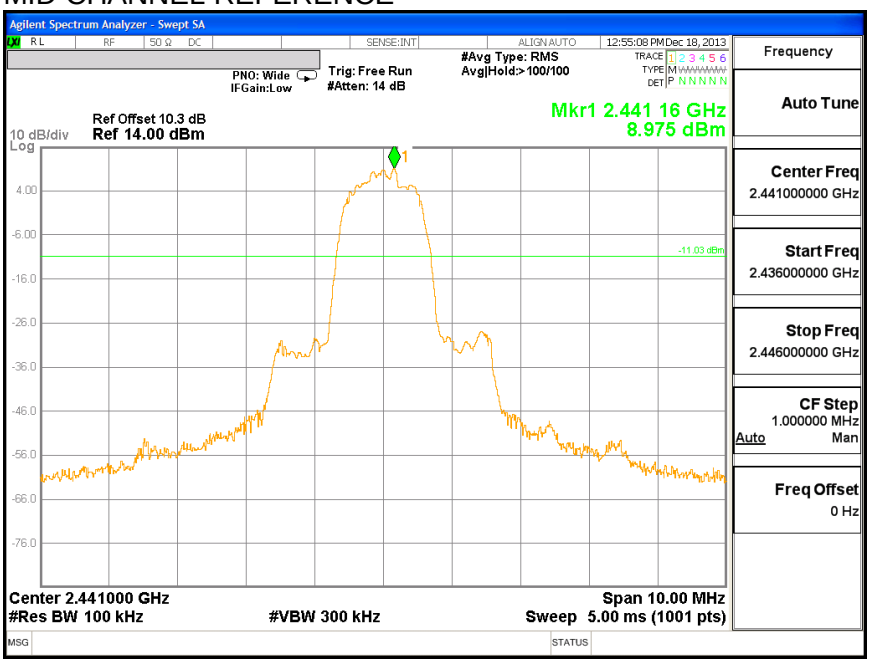


LOW CHANNEL SPURIOUS

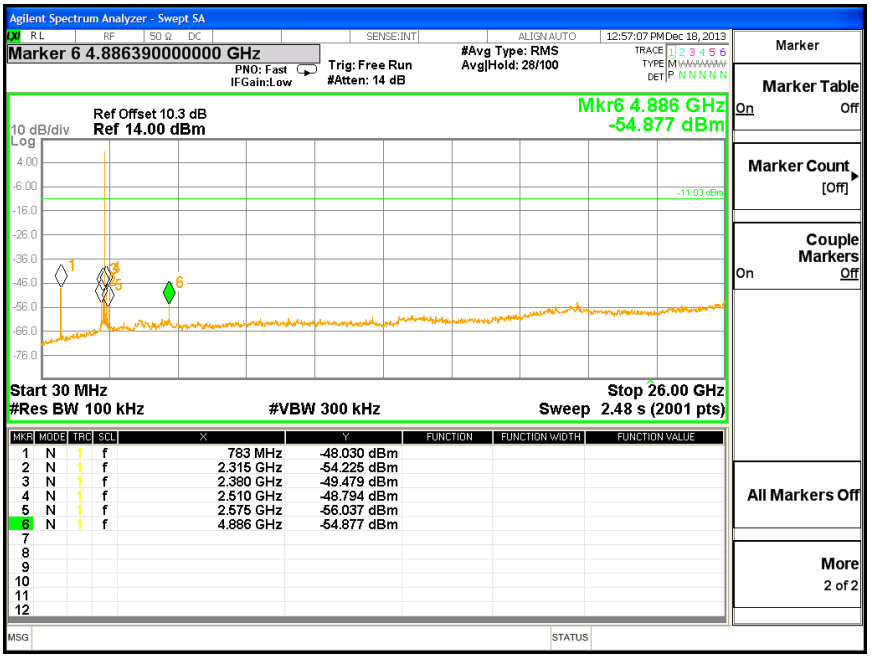


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

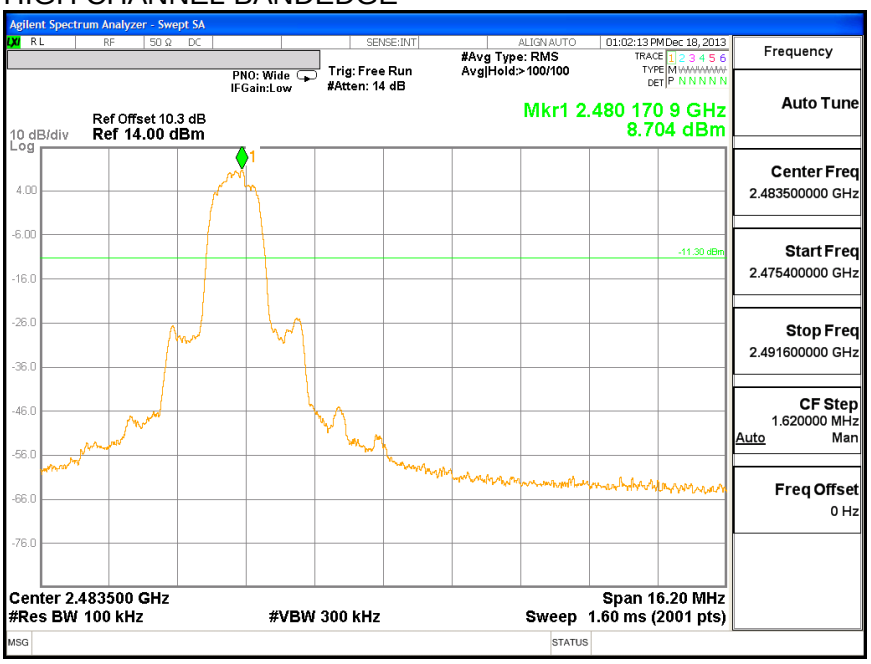


MID CHANNEL SPURIOUS

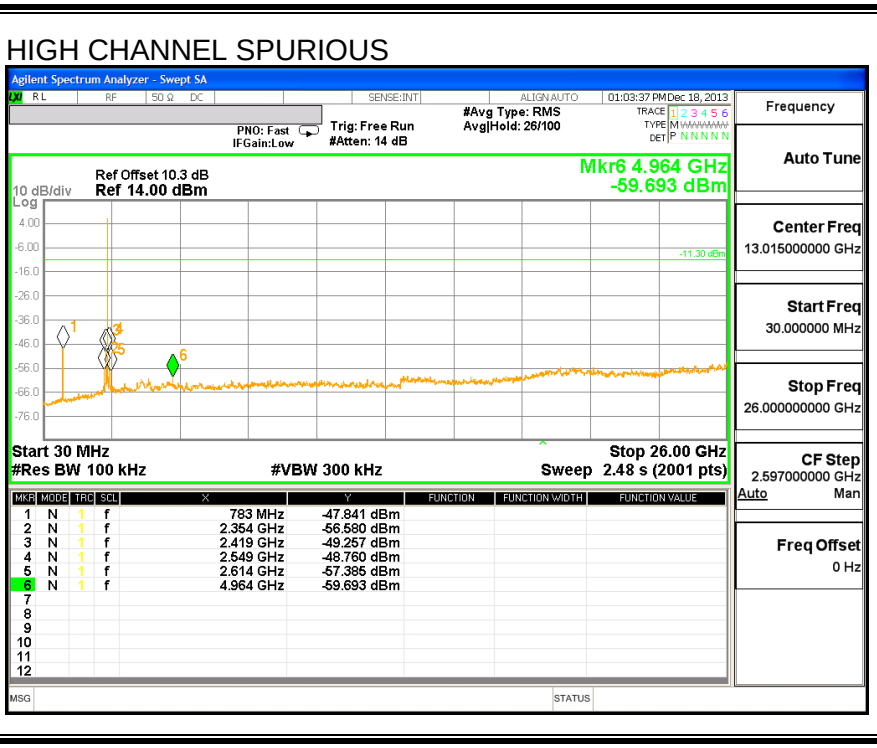


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

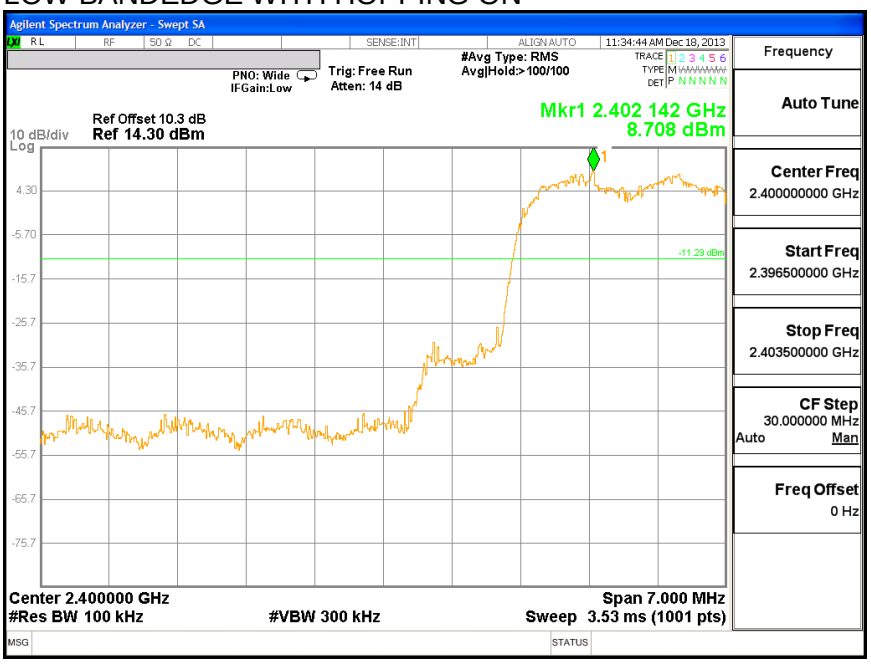


HIGH CHANNEL SPURIOUS

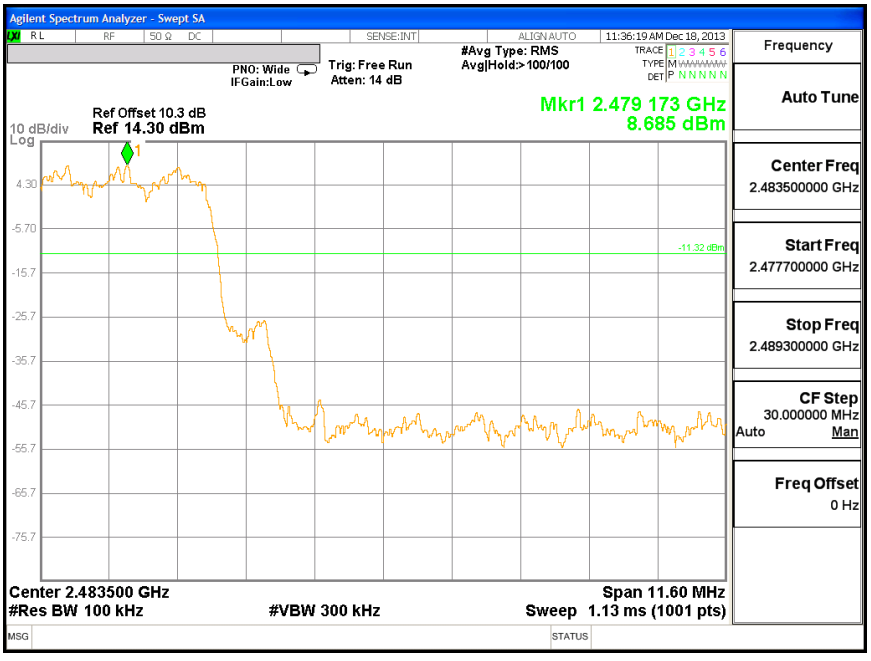


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 3 MHz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

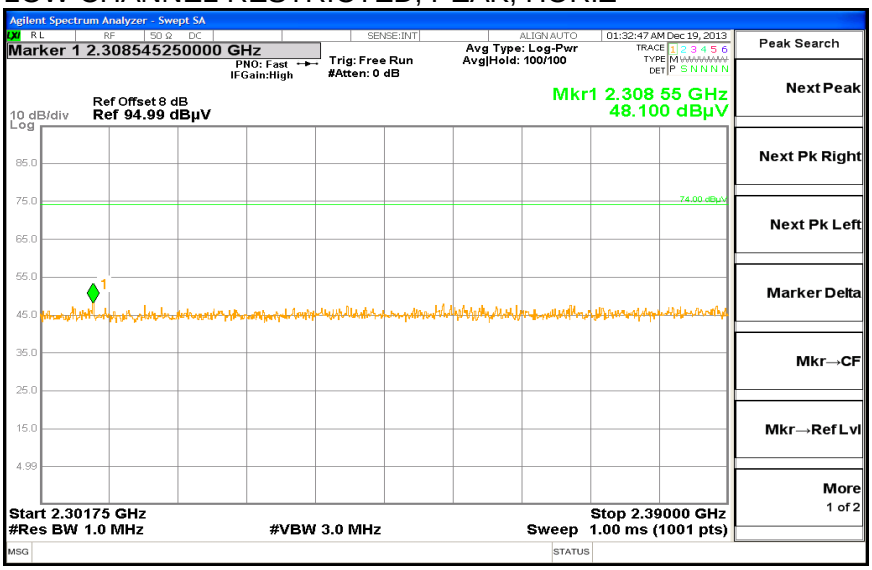
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

8.2. TRANSMITTER ABOVE 1 GHz

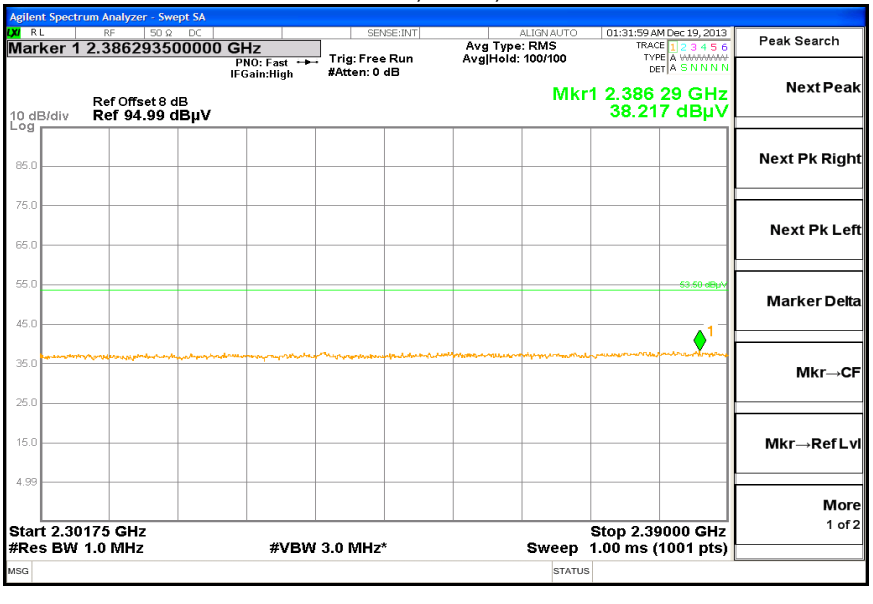
8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ

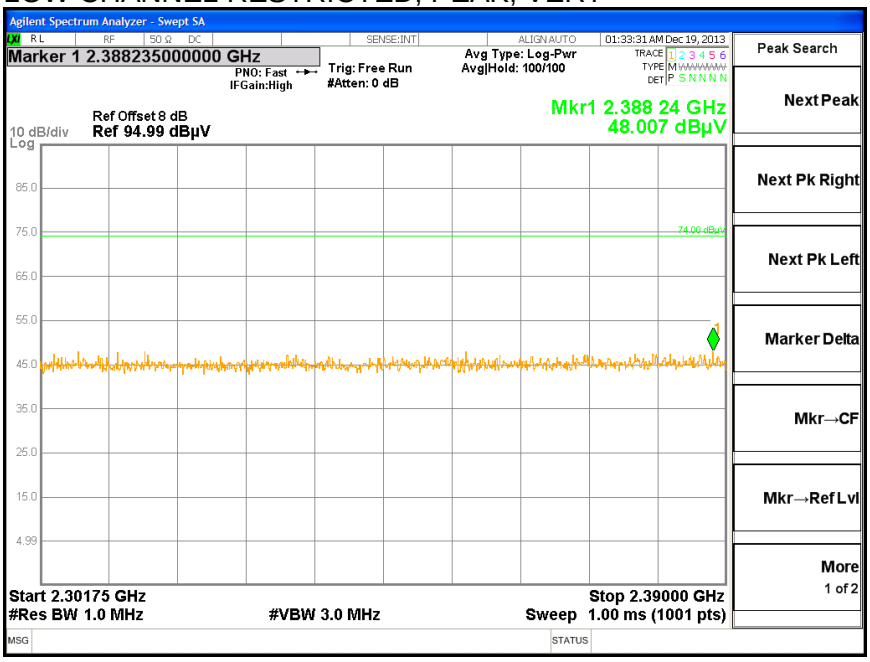


LOW CHANNEL RESTRICTED, AVG, HORIZ

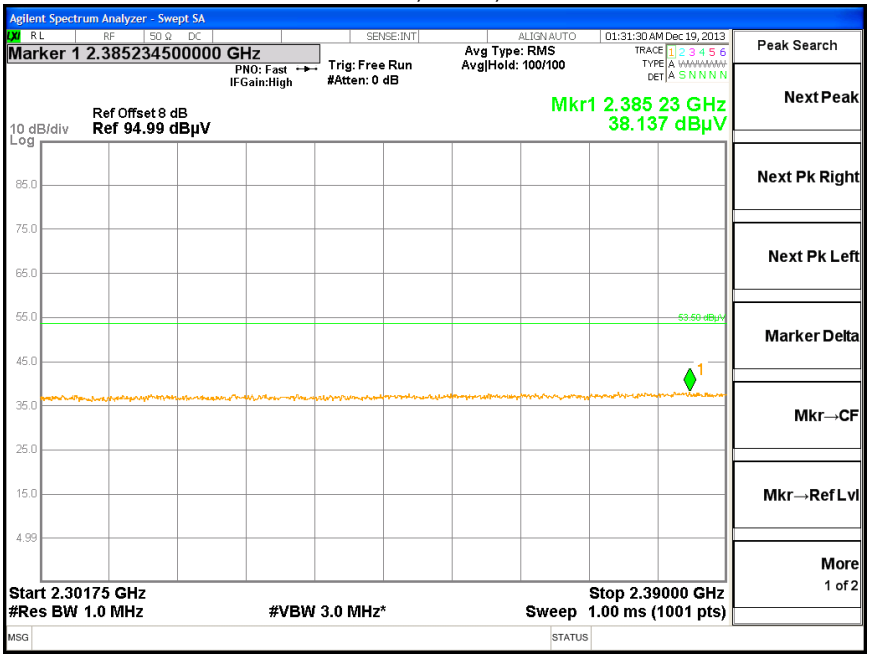


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL RESTRICTED, PEAK, VERT

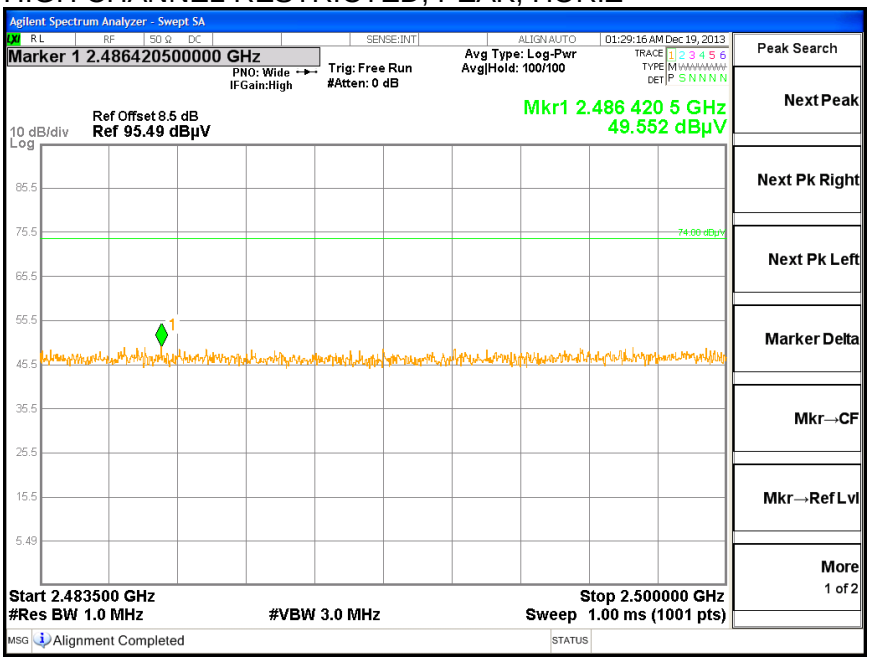


LOW CHANNEL RESTRICTED, AVG, VERT

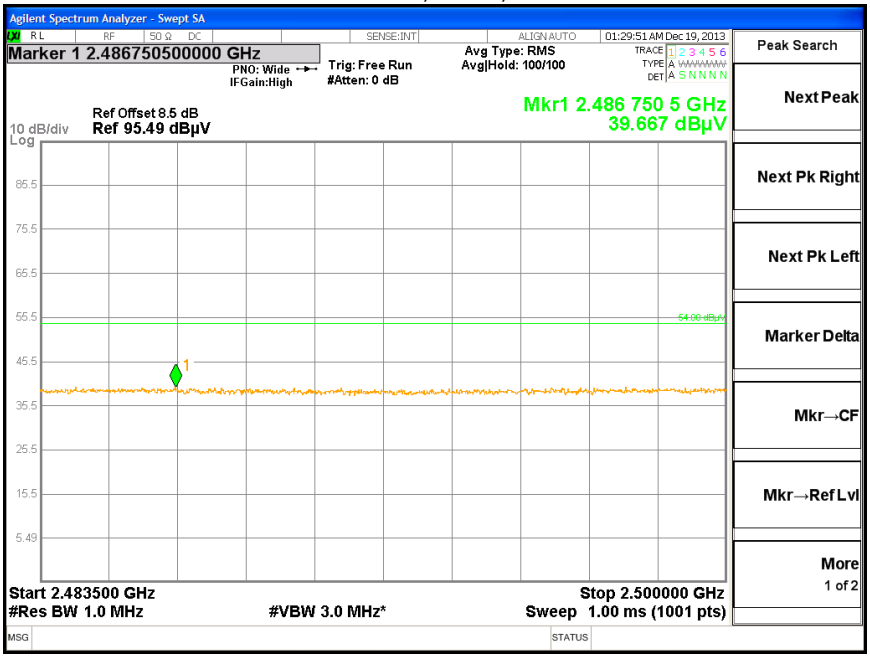


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

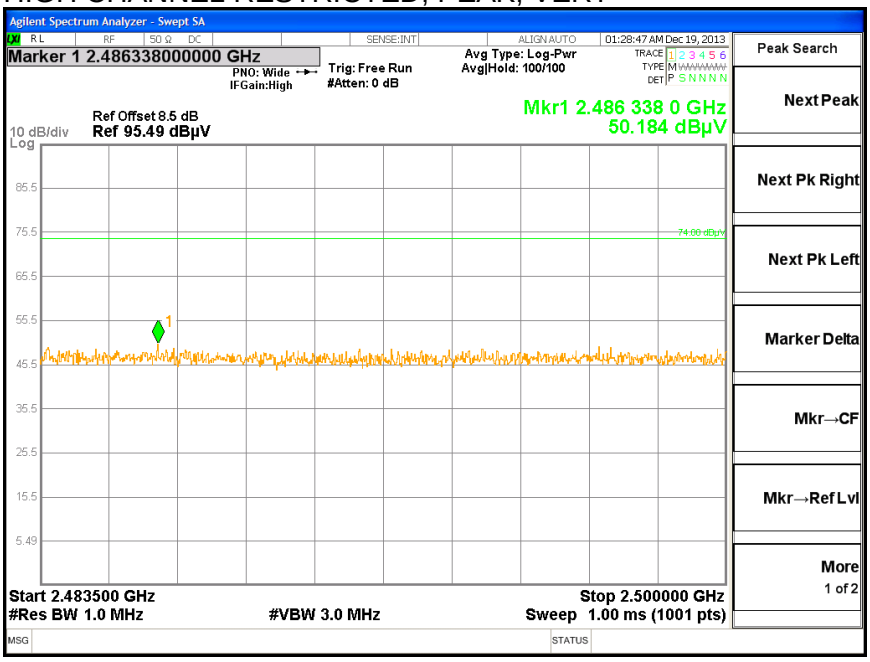


HIGH CHANNEL RESTRICTED, AVG, HORIZ

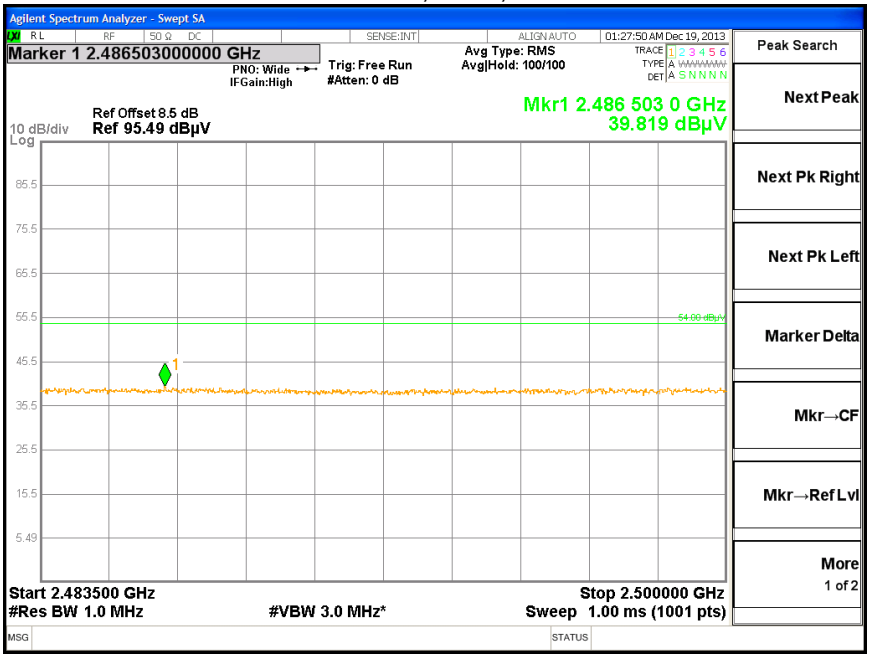


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK, VERT



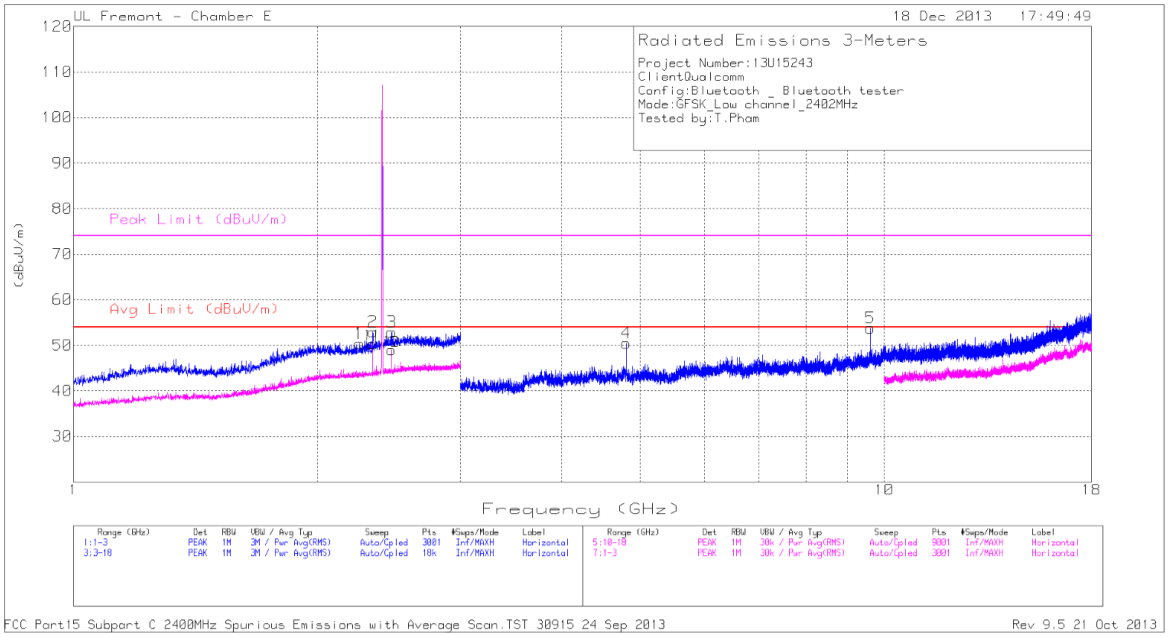
HIGH CHANNEL RESTRICTED, AVG, VERT



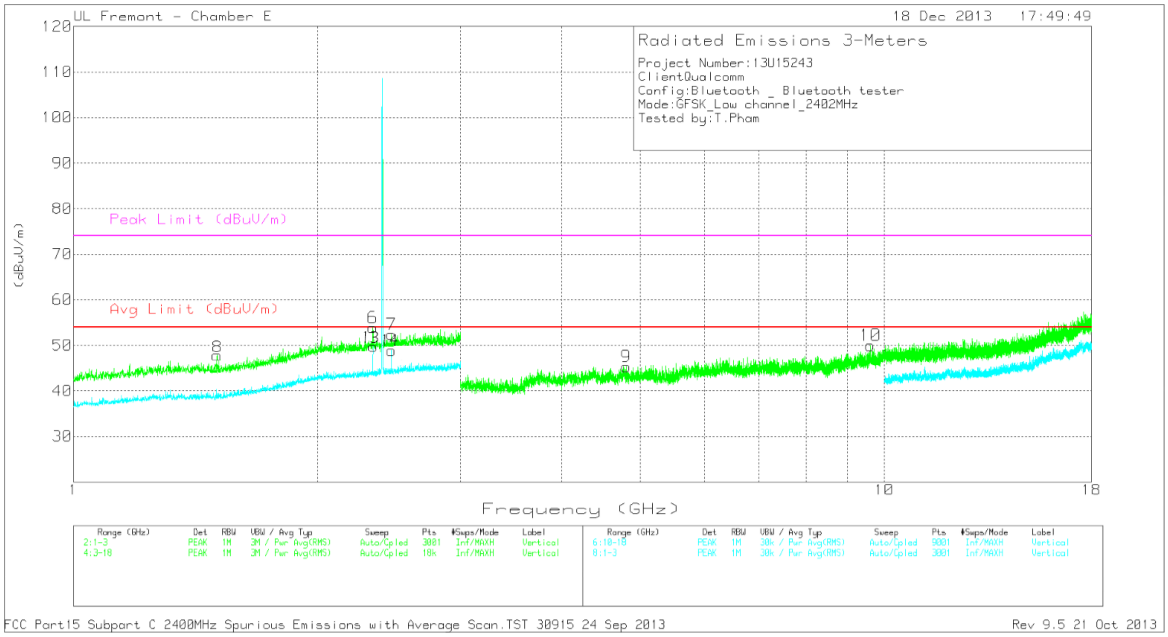
HARMONICS AND SPURIOUS EMISSIONS

Low Channel

LOW CHANNEL VERTICAL PLOT



LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*2.253	43.27	PK	32.4	-25.3	50.37	-	-	74	-23.63	0-360	100	H
2	*2.339	45.54	PK	32.5	-25.1	52.94	-	-	74	-21.06	0-360	199	H
6	*2.339	46.46	PK	32.5	-25.1	53.86	-	-	74	-20.14	0-360	199	V
8	*1.505	43.79	PK	28.8	-26.5	46.09	53.97	-7.91	74	-27.91	0-360	199	V
11	*2.338	42.32	Avg	32.5	-25.1	47.72	53.97	-6.25	-	-	0-360	199	H
13	*2.338	42.68	Avg	32.5	-25.1	50.08	53.97	-3.89	-	-	0-360	100	V
12	2.466	40.98	Avg	32.7	-24.7	46.98	53.97	-6.99	-	-	0-360	100	H
14	2.466	40.71	Avg	32.7	-24.7	48.71	53.97	-5.26	-	-	0-360	100	V
7	2.467	44.42	PK	32.7	-24.7	52.42	-	-	74	-21.58	0-360	199	V
3	2.468	44.88	PK	32.7	-24.7	52.88	-	-	74	-21.12	0-360	100	H

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/3G Hz HPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	*4.804	41.83	PK	34.4	-30.9	45.33	53.97	-8.64	74	-28.67	0-360	199	V
4	*4.805	46.97	PK	34.4	-30.9	50.47	53.97	-3.5	74	-23.53	0-360	199	H
5	9.609	41.09	PK	37.5	-24.8	53.79	53.97	-0.18	74	-20.21	0-360	100	H
10	9.609	37.28	PK	37.5	-24.8	49.98	53.97	-3.99	74	-24.02	0-360	199	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
*2.338	36.07	VB1	32.5	-25.1	43.47	53.97	-10.5	-	-	272	140	V
2.466	35.51	VB1	32.7	-24.7	43.51	53.97	-10.46	-	-	117	185	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/3G Hz HPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
*4.804	37.37	VB1	34.4	-30.9	40.87	53.97	-13.1	-	-	43	134	H
9.608	27.78	VB1	37.5	-24.8	40.48	53.97	-13.49	-	-	178	122	H
9.609	22.09	PK	37.5	-24.8	34.79	53.97	-19.18	-	-	14	243	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

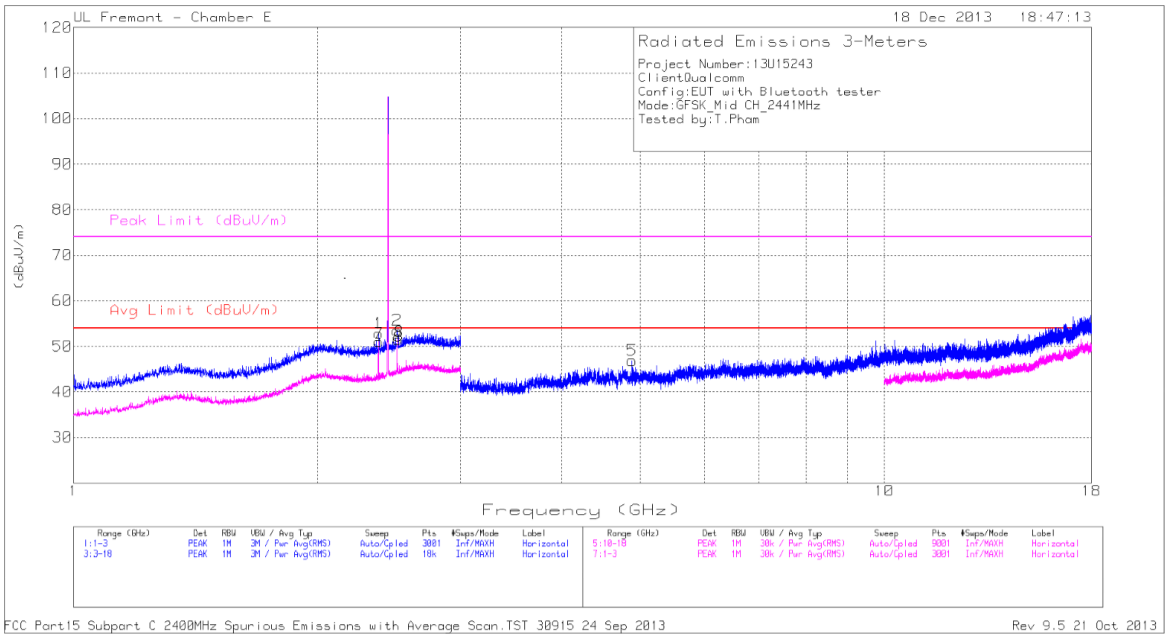
PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

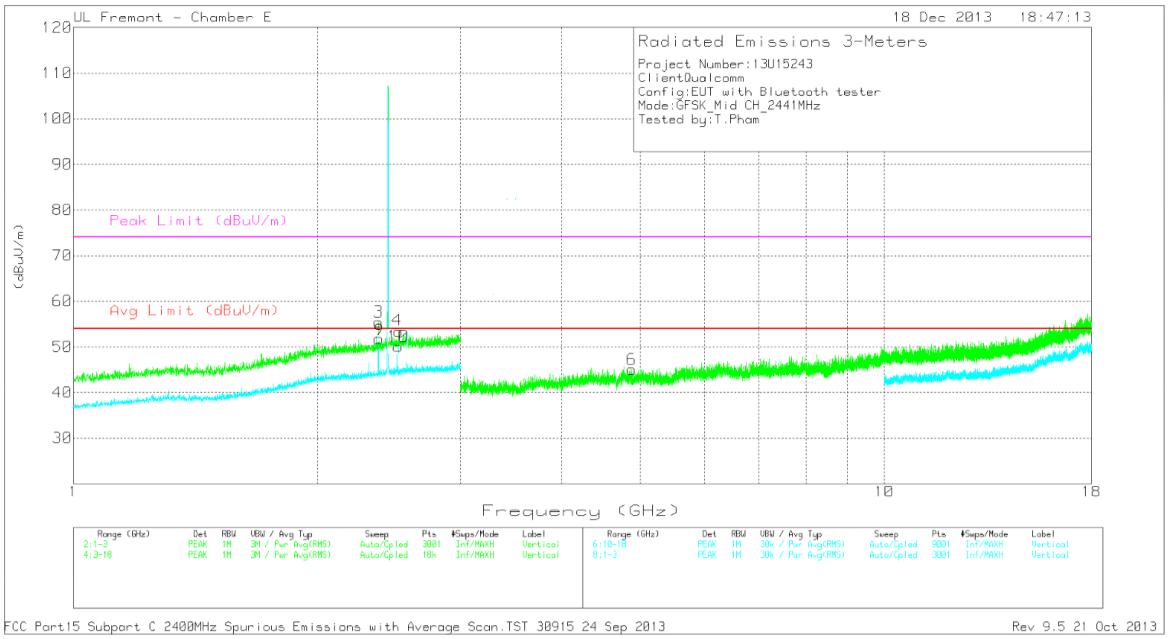
VB1 - KDB 789033 Method: VB Alternative Reduced Video

Mid Channel

MID CHANNEL VERTICAL PLOT



MID CHANNEL HORIZONTAL PLOT



MID CHANNEL HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*2.378	45.25	PK	32.6	-25	52.58	-	-	74	-21.15	0-360	199	H
3	*2.378	47.86	PK	32.6	-25	55.46	-	-	74	-18.54	0-360	200	V
7	*2.377	43.4	Avg	32.6	-25	51	53.97	-2.97	74	-23	0-360	199	H
9	*2.377	44.41	Avg	32.6	-25	52.01	53.97	-1.96	74	-21.99	0-360	100	V
8	2.505**	42.96	Avg	32.7	-24.4	47.26	53.97	-6.71	74	-22.74	0-360	100	H
10	2.505**	42.04	Avg	32.7	-24.4	46.34	53.97	-7.63	74	-23.66	0-360	100	V
2	2.506**	45.22	PK	32.7	-24.4	53.52	-	-	74	-20.48	0-360	100	H
4	2.507**	45.35	PK	32.7	-24.4	53.65	-	-	74	-20.35	0-360	100	V

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/3G Hz HPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	*4.882	41.63	PK	34.4	-31	45.03	53.97	-8.94	74	-28.97	0-360	100	V
5	*4.883	43.48	PK	34.4	-31	46.88	53.97	-7.09	74	-27.12	0-360	100	H

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
*2.377	41.63	VB1	32.6	-25	49.23	53.97	-4.74	-	-	58	377	H
*2.377	41	VB1	32.6	-25	48.6	53.97	-5.37	-	-	132	346	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

**- indicates un-restricted band

PK - Peak detector

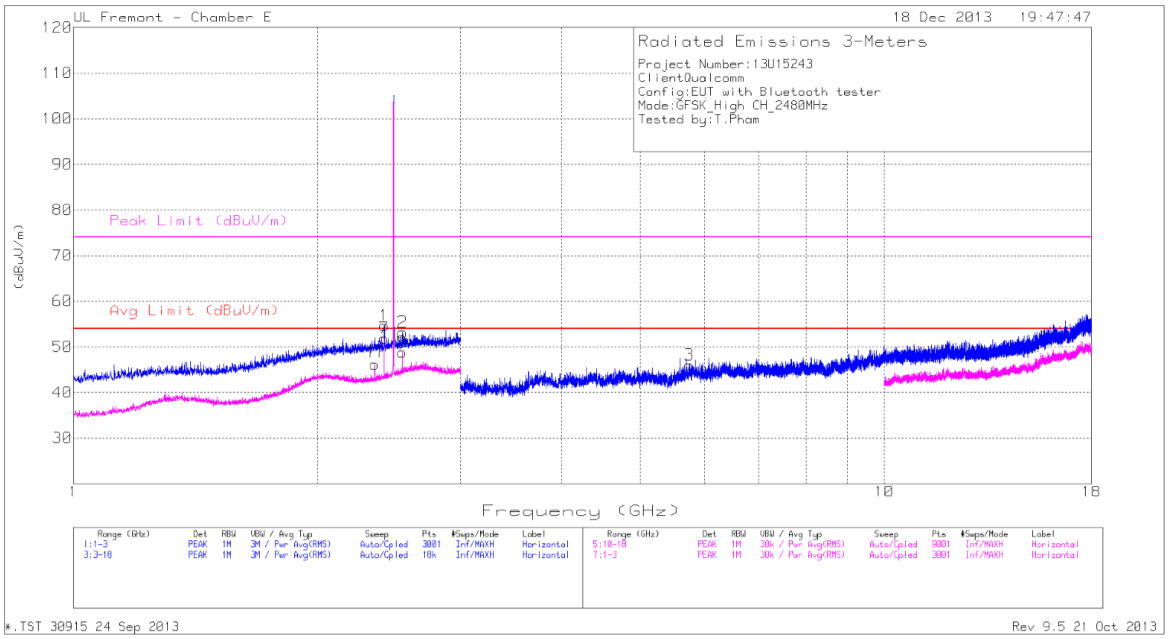
Avg - Video bandwidth < Resolution bandwidth

VB1 - KDB 789033 Method: VB Alternative Reduced Video

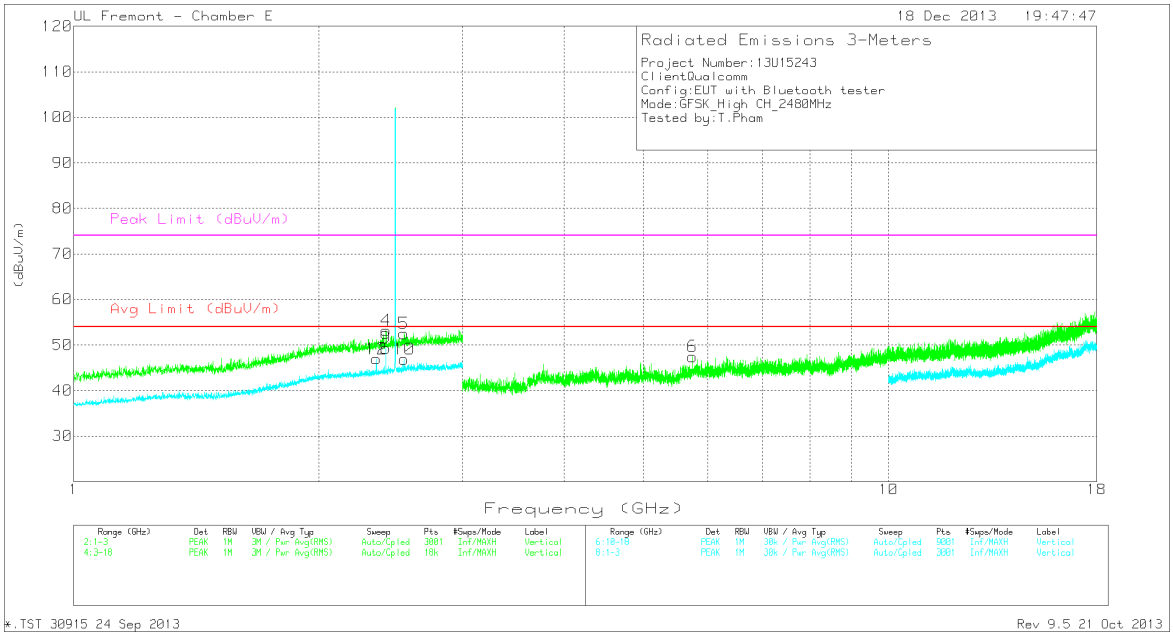
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

High Channel

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



HIGH CHANNEL HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
11	*2.352	39.53	Avg	32.5	-25.1	46.93	53.97	-7.04	-	-	0-360	100	H
12	*2.352	39.53	Avg	32.5	-25.1	46.93	53.97	-7.04	-	-	0-360	100	V
7	2.416	44.2	Avg	32.6	-24.9	51.9	53.97	-2.07	-	-	0-360	199	H
9	2.416	41.6	Avg	32.6	-24.9	49.3	53.97	-4.67	-	-	0-360	100	V
1	2.417	47	PK	32.6	-24.9	54.7	-	-	74	-19.3	0-360	199	H
4	2.417	45.48	PK	32.6	-24.9	53.18	-	-	74	-20.82	0-360	199	V
5	2.542	43.9	PK	32.8	-24.2	52.5	-	-	74	-21.5	0-360	100	V
8	2.544	40.22	Avg	32.8	-24.2	48.82	53.97	-5.15	74	-25.18	0-360	100	H
10	2.544	38.28	Avg	32.8	-24.2	46.88	53.97	-7.09	74	-27.12	0-360	199	V
2	2.545	44.55	PK	32.8	-24.2	53.15	-	-	74	-20.85	0-360	199	H

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/3G Hz HPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	5.746	41.84	PK	35.4	-29.8	47.44	53.97	-6.53	74	-26.56	0-360	101	V
3	5.747	40.44	PK	35.4	-29.8	46.04	53.97	-7.93	74	-27.96	0-360	199	H

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.416	42.39	VB1	32.6	-24.9	50.09	53.97	-3.88	-	-	90	238	H
2.416	37.18	VB1	32.6	-24.9	44.88	53.97	-9.09	-	-	66	200	V
2.544	36.78	VB1	32.8	-24.2	45.38	53.97	-8.59	-	-	117	267	H

**- indicates frequency in un-restricted band

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

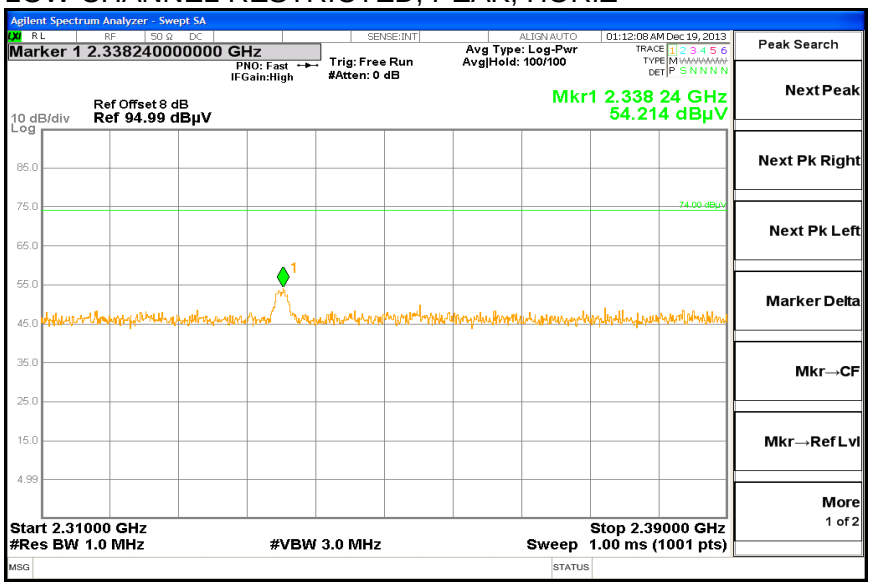
VB1 - KDB 789033 Method: VB Alternative Reduced Video

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

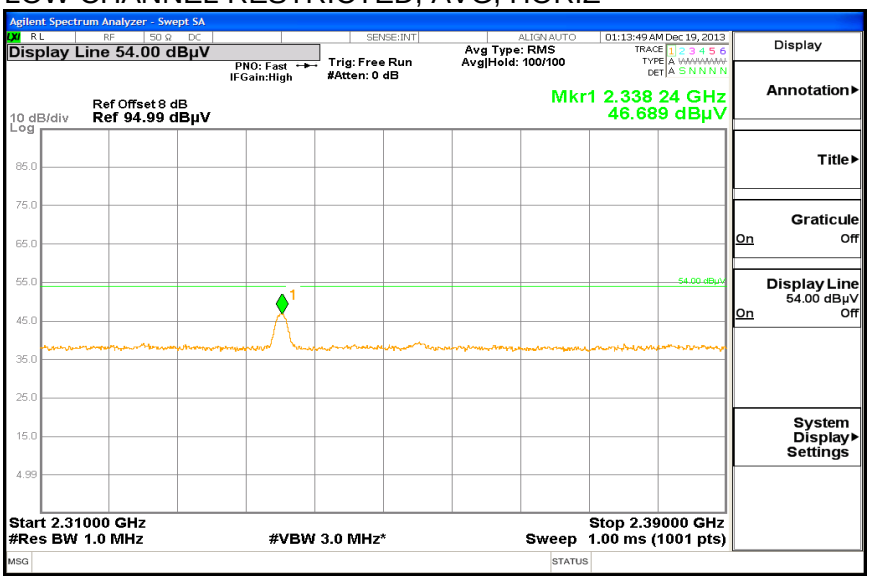
8.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ

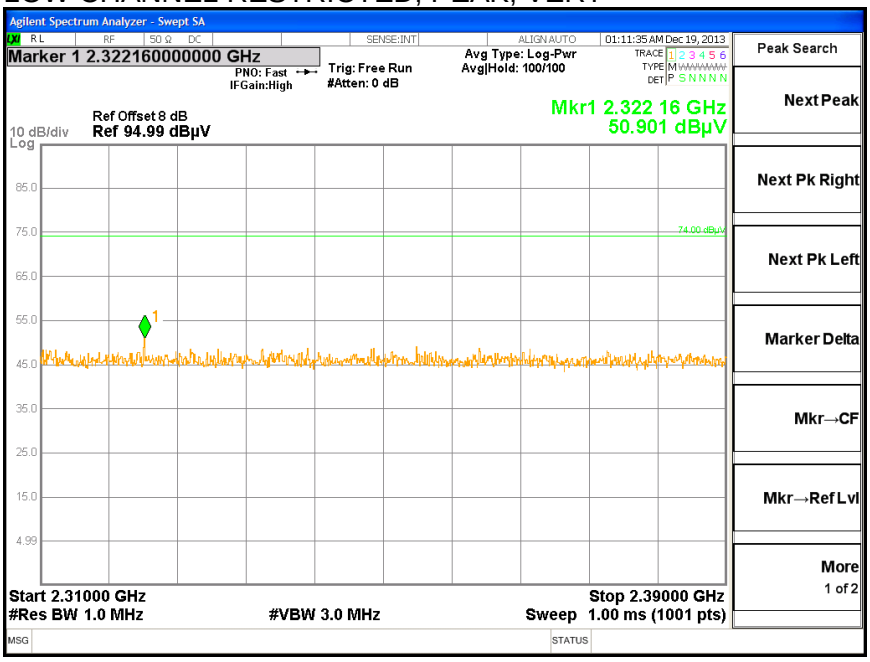


LOW CHANNEL RESTRICTED, AVG, HORIZ

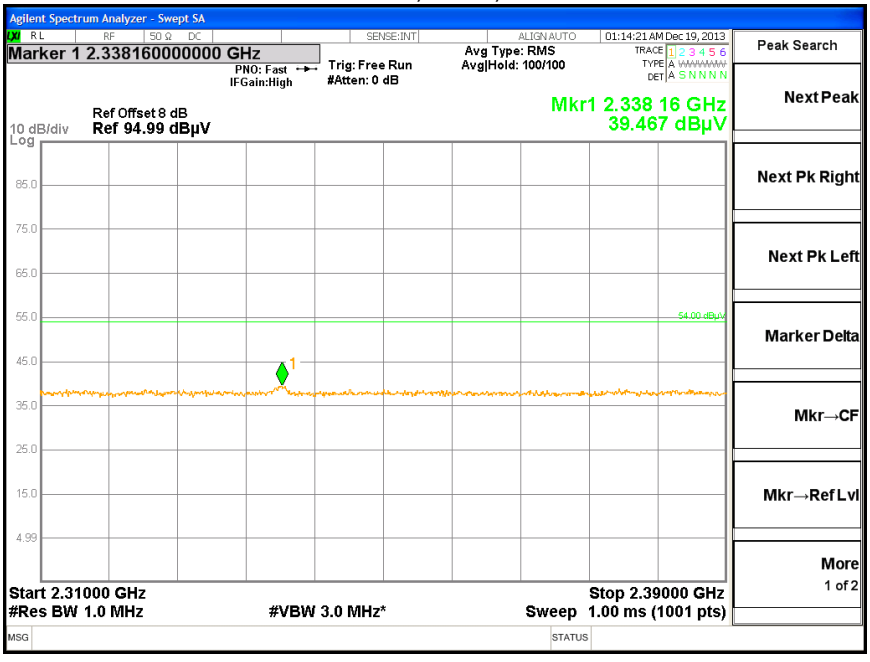


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL RESTRICTED, PEAK, VERT

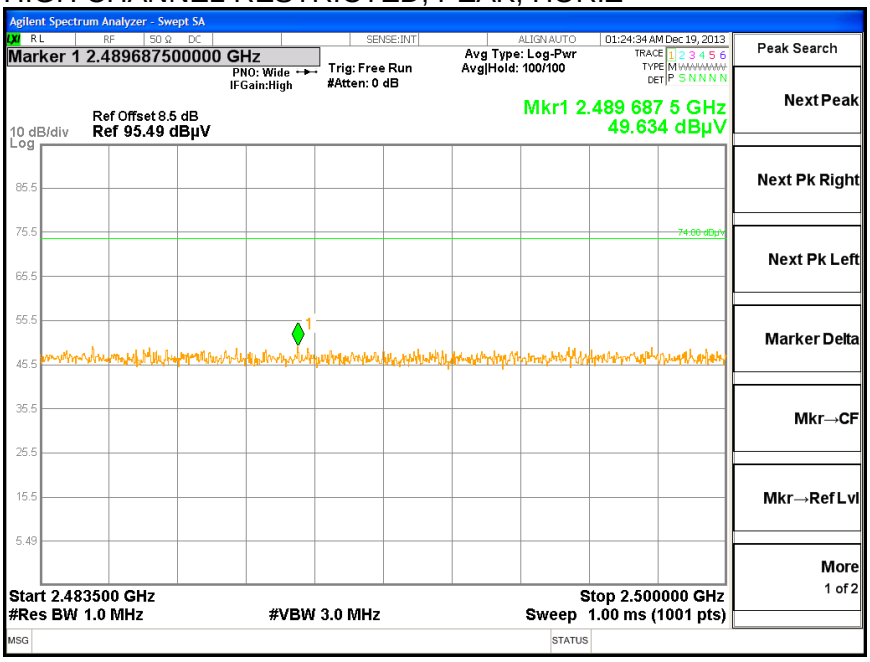


LOW CHANNEL RESTRICTED, AVG, VERT

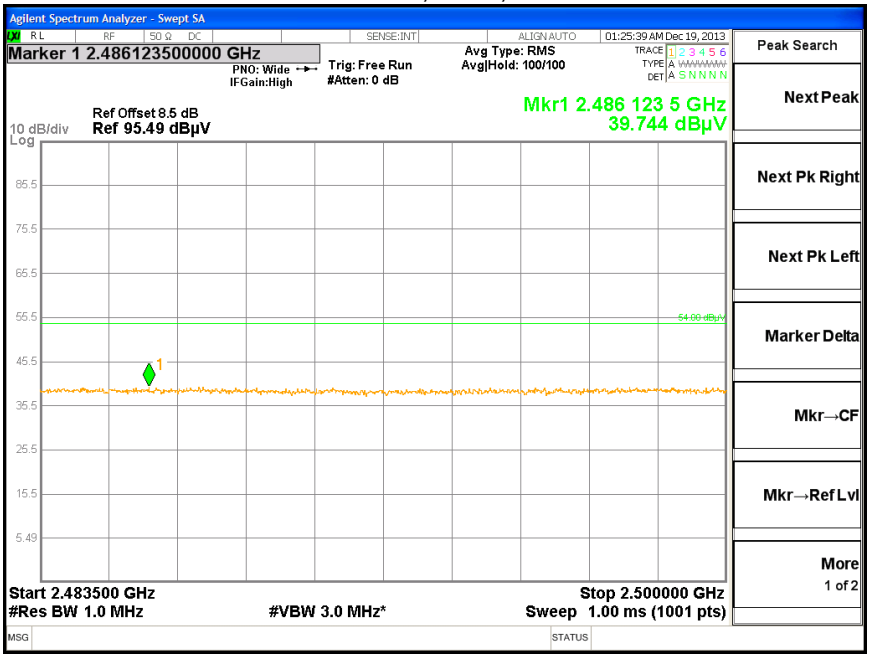


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

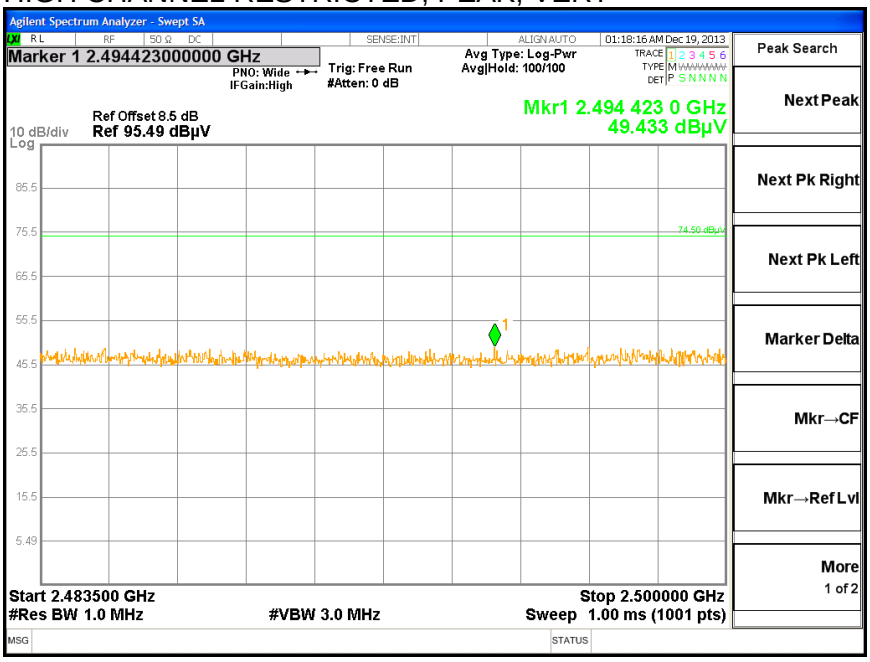


HIGH CHANNEL RESTRICTED, AVG, HORIZ

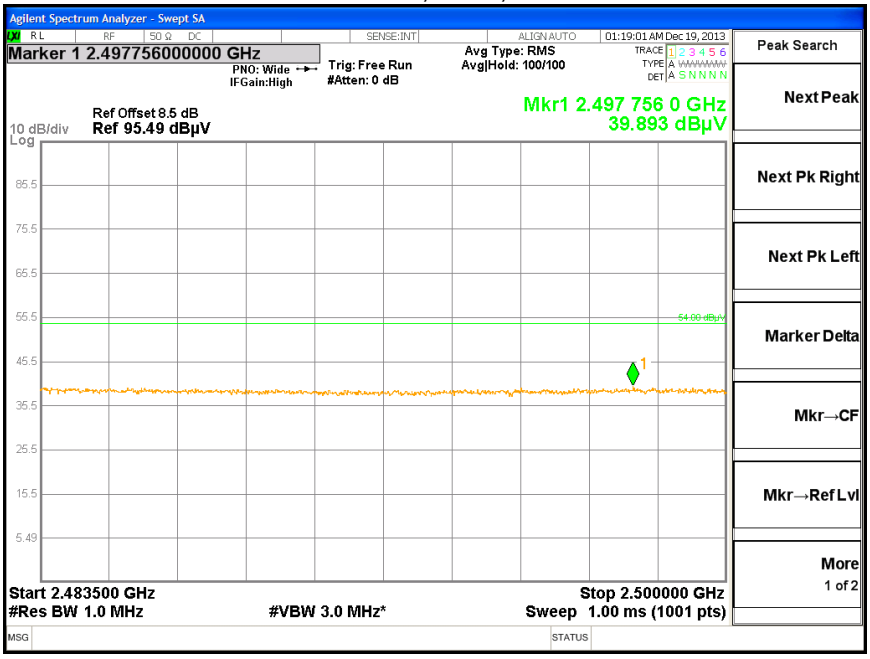


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK, VERT



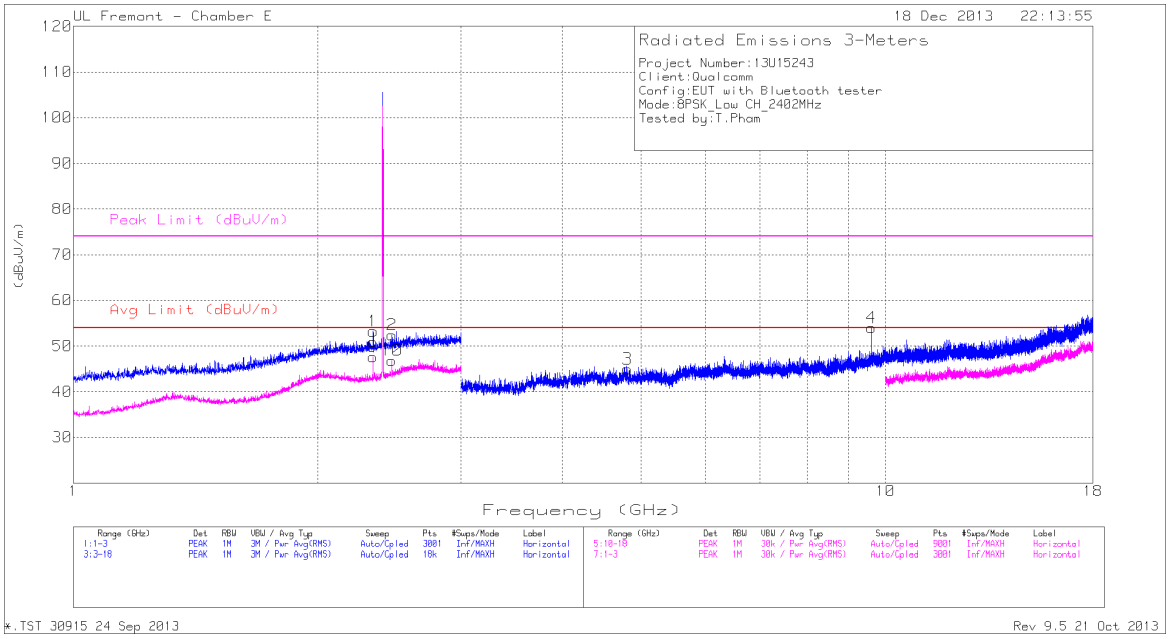
HIGH CHANNEL RESTRICTED, AVG, VERT



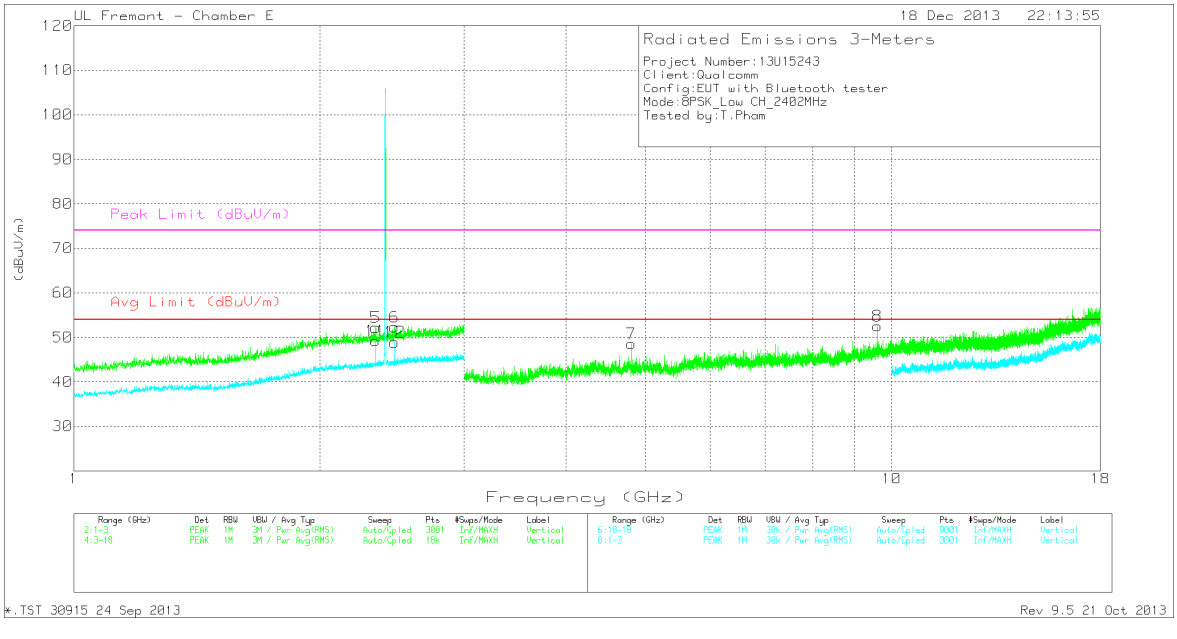
HARMONICS AND SPURIOUS EMISSIONS

Low Channel

LOW CHANNEL VERTICAL PLOT



LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*2.339	45.87	PK	32.5	-25.1	53.27	-	-	74	-20.73	0-360	199	H
5	*2.339	44.83	PK	32.5	-25.1	52.23	-	-	74	-21.77	0-360	199	V
9	*2.338	40.27	Avg	32.5	-25.1	47.67	53.97	-6.3	-	-	0-360	199	H
11	*2.338	41.82	Avg	32.5	-25.1	49.22	53.97	-4.75	-	-	0-360	199	V
10	2.466**	38.87	Avg	32.7	-24.7	46.87	53.97	-7.1	-	-	0-360	100	H
2	2.467	44.45	PK	32.7	-24.7	52.45	-	-	74	-21.55	0-360	99	H
6	2.467	44.34	PK	32.7	-24.7	52.34	-	-	74	-21.66	0-360	100	V
12	2.467**	40.91	Avg	32.7	-24.7	47.91	53.97	-6.06	-	-	0-360	101	V

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/3G Hz HPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7	*4.805	45.03	PK	34.4	-30.9	48.53	-	-	74	-25.47	0-360	101	V
3	*4.808	41.54	PK	34.4	-31	44.94	-	-	74	-29.06	0-360	199	H
4	9.609**	41.3	PK	37.5	-24.8	54	-	-	74	-20	0-360	100	H
8	9.609**	39.85	PK	37.5	-24.8	52.55	-	-	74	-21.45	0-360	199	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
*2.338	35.93	VB1	32.5	-25.1	43.33	53.97	-10.64	74	-30.67	278	136	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

**-indicates frequency at un-restricted band

PK - Peak detector

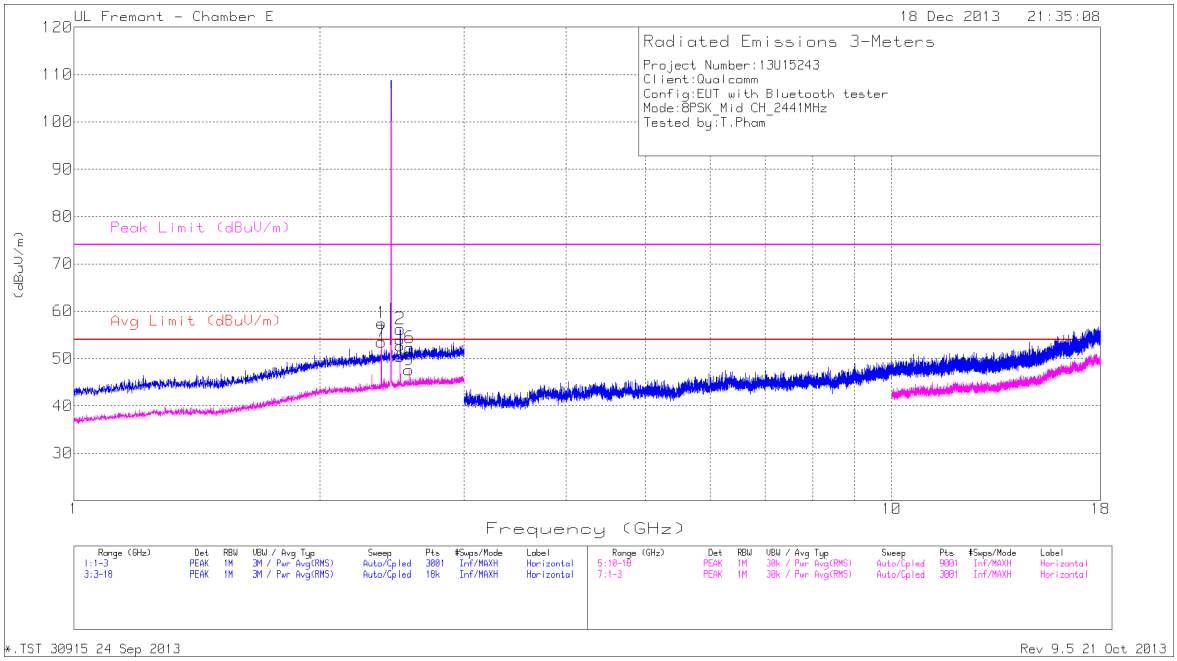
Avg - Video bandwidth < Resolution bandwidth

VB1 - KDB 789033 Method: VB Alternative Reduced Video

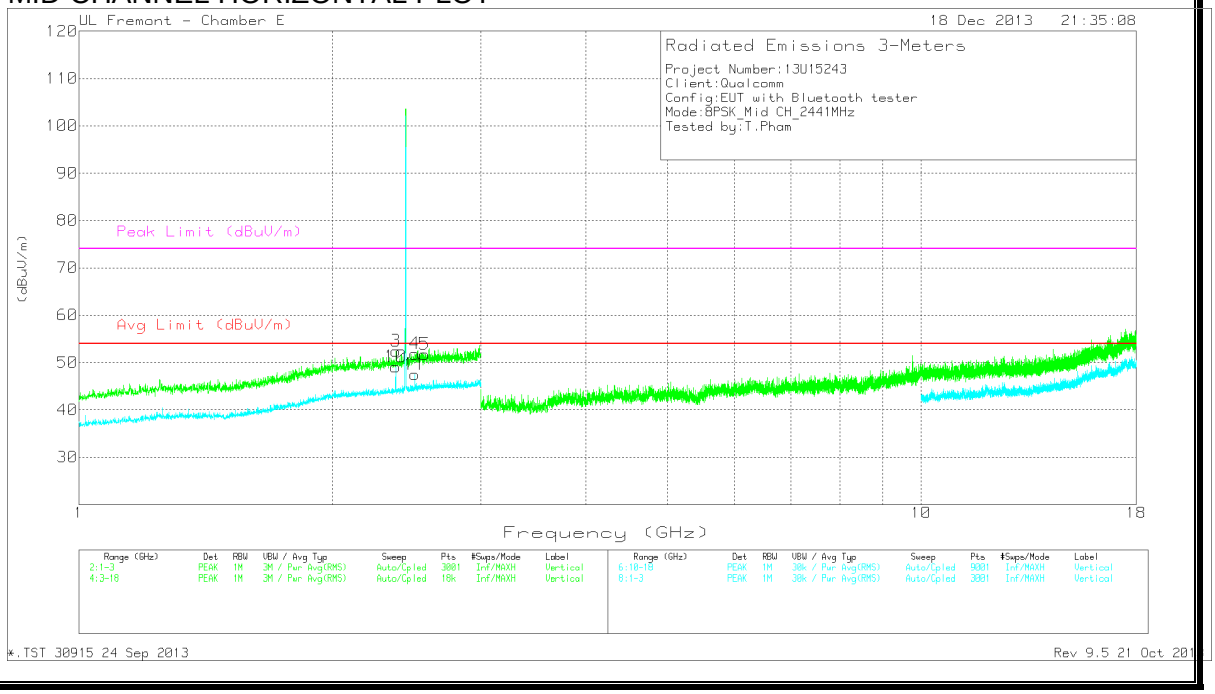
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

Mid Channel

MID CHANNEL VERTICAL PLOT



MID CHANNEL HORIZONTAL PLOT



MID CHANNEL HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*2.378	49.88	PK	32.6	-25	57.48	-	-	74	-16.52	0-360	199	H
3	*2.379	44.82	PK	32.6	-25	52.42	-	-	74	-21.58	0-360	199	V
7	*2.377	45.93	Avg	32.6	-25	53.53	53.97	-0.44	74	-20.47	0-360	199	H
10	*2.377	41.49	Avg	32.6	-25	49.09	53.97	-4.88	74	-24.91	0-360	199	V
4	2.503	43.51	PK	32.7	-24.4	51.81	-	-	74	-22.19	0-360	199	V
8	2.505	42.2	Avg	32.7	-24.4	50.5	53.97	-3.47	74	-23.5	0-360	100	H
11	2.505	39.18	Avg	32.7	-24.4	47.48	53.97	-6.49	74	-26.52	0-360	100	V
2	2.506	47.91	PK	32.7	-24.4	56.21	-	-	74	-17.79	0-360	100	H
9	2.569	39.02	Avg	32.8	-24.2	47.62	53.97	-6.35	74	-26.38	0-360	100	H
5	2.572**	43.22	PK	32.8	-24.3	51.72	-	-	74	-22.28	0-360	100	V
6	2.575**	43.67	PK	32.8	-24.2	52.27	-	-	74	-21.73	0-360	100	H

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
*2.377	43.73	VB1	32.6	-25	51.33	53.97	-2.64	-	-	242	379	H
*2.377	39.06	VB1	32.6	-25	46.66	53.97	-7.31	-	-	2	362	V
2.505	41.35	VB1	32.7	-24.4	49.65	53.97	-4.32	-	-	246	276	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

** - indicates frequency in un-restricted Band

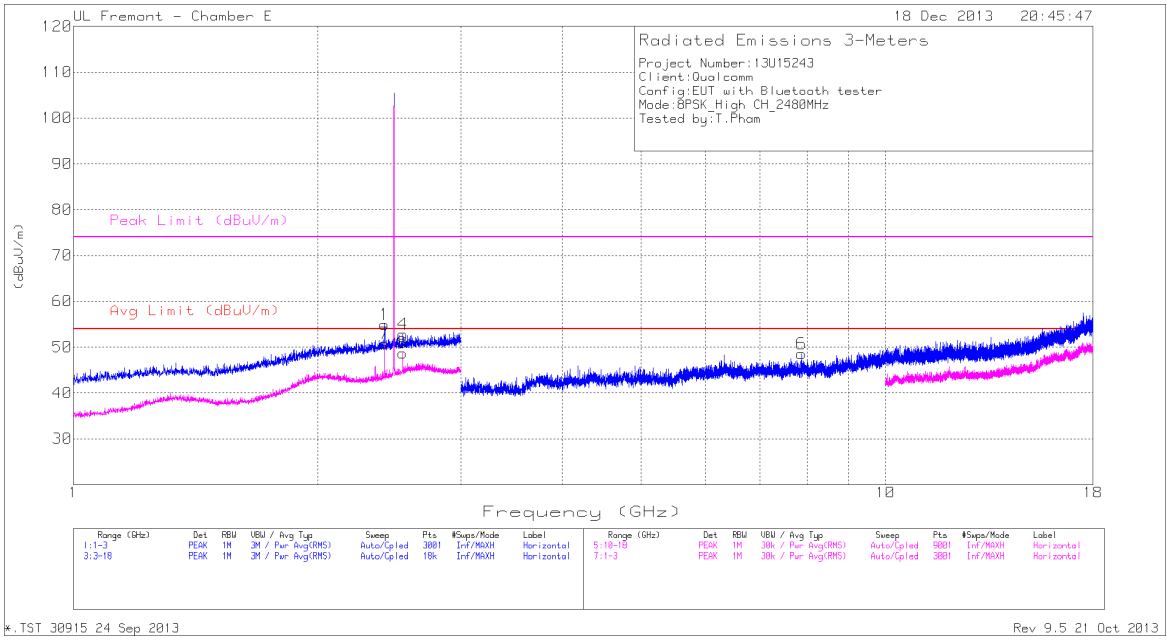
PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

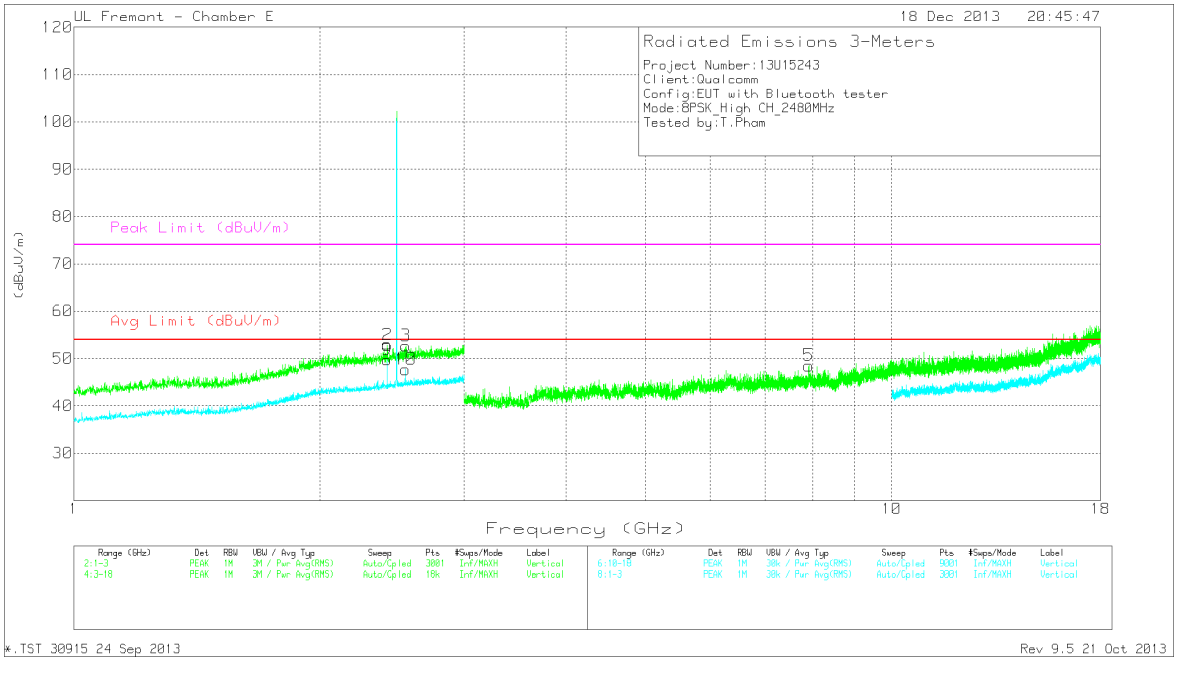
VB1 - KDB 789033 Method: VB Alternative Reduced Video

High Channel

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



HIGH CHANNEL HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7	2.416	43.09	Avg	32.6	-24.9	50.79	53.97	-3.18	74	-23.21	0-360	199	H
9	2.416	42.07	Avg	32.6	-24.9	49.77	53.97	-4.2	74	-24.23	0-360	100	V
1	2.417	47.21	PK	32.6	-24.9	54.91	-	-	74	-19.09	0-360	199	H
2	2.417	45.16	PK	32.6	-24.9	52.86	-	-	74	-21.14	0-360	199	V
8	2.544	40.11	Avg	32.8	-24.2	48.71	53.97	-5.26	74	-25.29	0-360	100	H
10	2.544	39.1	Avg	32.8	-24.2	47.7	53.97	-6.27	74	-26.3	0-360	199	V
4	2.545	44.22	PK	32.8	-24.2	52.82	-	-	74	-21.18	0-360	100	H
3	2.546	44.07	PK	32.8	-24.2	52.67	-	-	74	-21.33	0-360	199	V

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/3G Hz HPF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	7.877	39.6	PK	36.2	-27.9	47.9	53.97	-6.07	74	-26.1	0-360	199	H
5	7.918	38.65	PK	36.2	-26.9	47.95	53.97	-6.02	74	-26.05	0-360	199	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/10 dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.415	32.43	VB1	32.6	-24.9	40.13	53.97	-13.84	-	-	279	322	V
2.417	32.23	VB1	32.6	-24.9	39.93	53.97	-14.04	-	-	51	297	H
2.543	32.26	VB1	32.8	-24.2	40.86	53.97	-13.11	-	-	283	285	H

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

VB1 - KDB 789033 Method: VB Alternative Reduced Video

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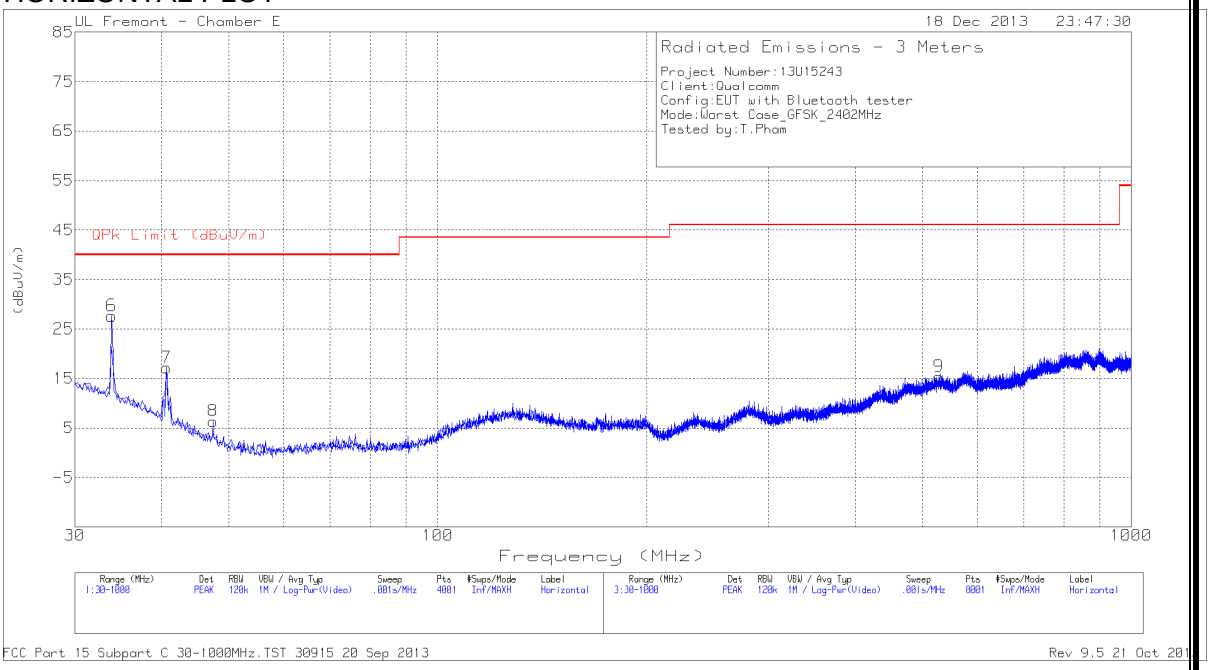
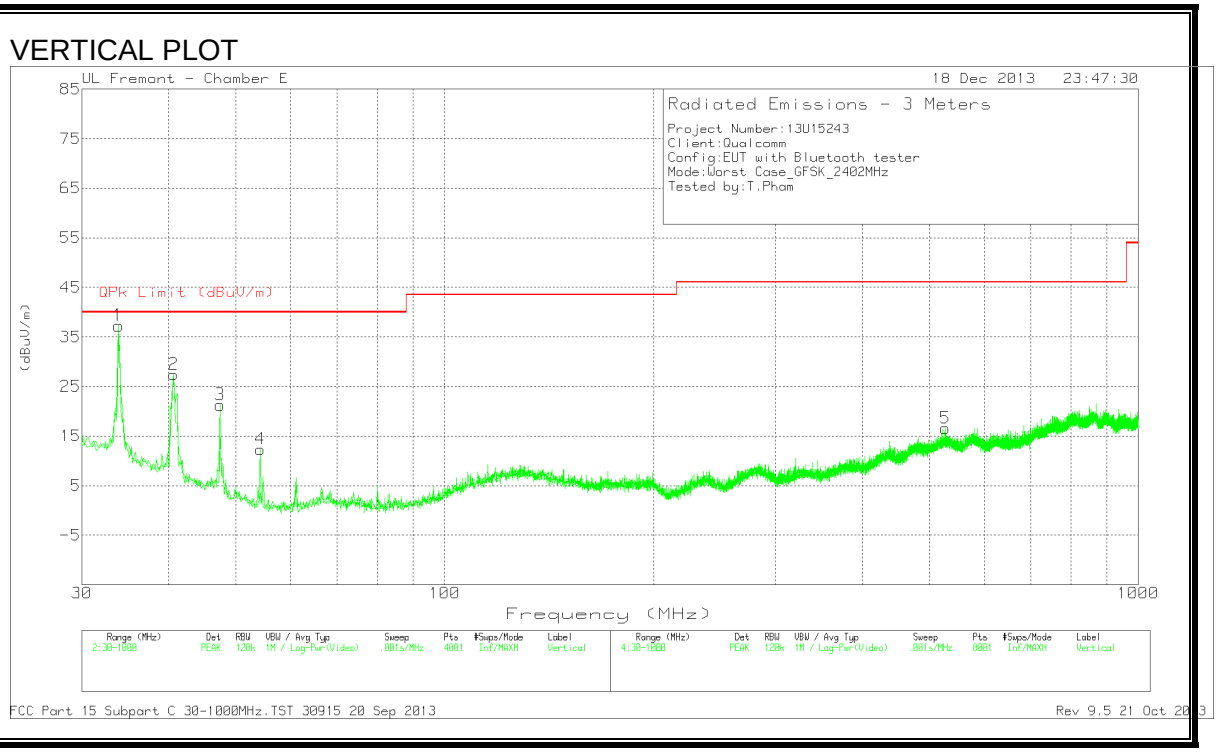
8.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



VERTICAL PLOT



VERTICAL AND HORIZONTAL DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	33.88	46.47	PK	18.4	-27.6	33.27	40	-6.73	0-360	100	V
6	33.88	36.83	PK	18.4	-27.6	27.63	40	-12.37	0-360	200	H
2	40.67	41.31	PK	13.4	-27.3	27.41	40	-12.59	0-360	100	V
7	40.67	31.09	PK	13.4	-27.3	17.19	40	-22.81	0-360	300	H
8	47.46	24.99	PK	9	-27.6	6.39	40	-33.61	0-360	200	H
3	47.46	39.86	PK	9	-27.6	21.26	40	-18.74	0-360	99	V
4	54.25	32.94	PK	7.1	-27.7	12.34	40	-27.66	0-360	99	V
5	527.0038	24.16	PK	18.2	-25.8	16.56	46.02	-29.46	0-360	300	V
9	527.8525	22.87	PK	18.3	-25.8	15.37	46.02	-30.65	0-360	200	H

PK - Peak detector

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